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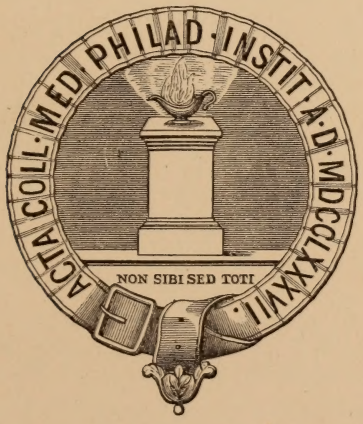

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1888.

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COLLEGE OF PHYSICIANS OF PHILADELPHIA.

1888.

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JOHN M. KEATING, M.D.,
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THEOPHILUS PARVIN, M.D.,
JAMES V. INGHAM, M.D.

1884

LIST

OF THE

PRESIDENTS OF THE COLLEGE FROM THE TIME OF ITS INSTITUTION.

ELECTED	
1787.	JOHN REDMAN, M.D.
1805.	WILLIAM SHIPPEN, M.D.
1809.	ADAM KUHN, M.D.
1818.	THOMAS PARKE, M.D.
1835.	THOMAS C. JAMES, M.D.
1835.	THOMAS T. HEWSON, M.D.
1848.	GEORGE B. WOOD, M.D., LL.D
1879.	W. S. W. RUSCHENBERGER, M.D.
1883.	ALFRED STILLÉ, M.D., LL.D.
1884.	SAMUEL LEWIS, M.D.
1884.	J. M. DA COSTA, M.D., LL.D.
1886.	S. WEIR MITCHELL, M.D.

FELLOWS

OF THE

COLLEGE OF PHYSICIANS OF PHILADELPHIA.

DECEMBER, 1888.

[Non-resident Fellows are marked (*).]

ELECTED

1883. Abbot, Griffith E., Ph.D., M.D.

1870. Adler, John M., M.D.

1859. Agnew, D. Hayes, M.D., LL.D., Professor of Surgery in the University of Pennsylvania; Consulting Surgeon to the Orthopædic and to St. Christopher's Hospitals.

1876. Alison, Robert H., M.D.

1867. Allen, Harrison, M.D., Emeritus Professor of Physiology in the University of Pennsylvania; Consulting Surgeon to the Mission Hospital.

1873. Allis, Oscar H., M.D., Surgeon to the Presbyterian Hospital.

1888. Anders, James M., M.D., Lecturer on Botany and Materia Medica in Medico-Chirurgical College, Philadelphia; Physician in Charge of Department for Children North Fourth Street Mission.

1869. Andrews, T. Hollingsworth, M.D., Consulting Surgeon to the Hospital of the Good Shepherd, Radnor.

*1882. Ashbridge, Richard, M.D., Assistant Surgeon U. S. Navy.

ELECTED

1863. Ashhurst, John, Jr., M.D., Professor of Clinical Surgery in the University of Pennsylvania; Surgeon to the Pennsylvania and the Children's Hospitals; Consulting Surgeon to St. Christopher's Hospital and to the Hospital of the Good Shepherd, Radnor.

1865. Ashhurst, Samuel, M.D., Surgeon to the Children's Hospital.

1857. Atlee, Walter F., M.D., Consulting Physician and Surgeon to St. Luke's Hospital, Bethlehem.

1852. Bache, Thomas Hewson, M.D.

1883. Baer, Benjamin F., M.D., Professor of Obstetrics and Gynecology in the Philadelphia Polyclinic; Obstetrician to the Maternity Hospital.

1879. Baker, Washington H., M.D., Obstetrician to the Maternity Hospital; Assistant Physician to the Philadelphia Lying-in Charity and to St. Christopher's Hospital; Assistant Surgeon to the Orthopædic Hospital.

1876. Baldwin, Louis K., M.D., Examining Physician to the Hospital of the Good Shepherd, Radnor.

1880. Bartholow, Roberts, M.D., Professor of Materia Medica and General Therapeutics in the Jefferson Medical College.

1883. Baum, Charles, M.D., Visiting Physician to the Northern Dispensary.

1873. Baxter, H. F., M.D.

1883. Beates, Henry, M.D.

1860. Benner, Henry D., M.D.

1874. Bennett, W. H., M.D., Physician to the Episcopal and to St. Christopher's Hospitals.

1884. Biddle, Alexander W., M.D.

1884. Biddle, Thomas, M.D.

*1866. Black, J. J., M.D.

*1867. Boardman, Charles H., M.D.

ELECTED

1859. Boker, Charles S., M.D., Surgeon to St. Joseph's Hospital.

1884. Bradford, Thomas Hewson, M.D.

1856. Brinton, John H., M.D., Professor of the Practice of Surgery and Clinical Surgery in the Jefferson Medical College; Surgeon to St. Joseph's Hospital; Consulting Surgeon to the Southwestern Hospital of Philadelphia.

1887. Brubaker, Albert P., M.D.

1878. Bruen, Edward T., M.D., Assistant Professor of Physical Diagnosis in the University of Pennsylvania; Physician to the Philadelphia Hospital.

*1851. Bullock, William R., M.D.

1887. Bunting, Ross R., M.D.

1870. Burnett, Charles H., M.D., Aurist to the Presbyterian Hospital; Consulting Aurist to the Pennsylvania Institution for the Deaf and Dumb.

1886. Cadwalader, Charles E., M.D.

1885. Chapin, John B., M.D., Physician to the Pennsylvania Hospital for the Insane.

1880. Chapman, Henry C., M.D., Professor of the Institutes of Medicine and of Medical Jurisprudence in the Jefferson Medical College.

1868. Cheston, D. Murray, M.D.

1873. Clark, Leonardo S., M.D.

1872. Cleemann, Richard A., M.D.

*1842. Clymer, Meredith, M.D.

1871. Cohen, J. Solis, M.D., Professor of Diseases of the Throat and Chest in the Philadelphia Polyclinic; Physician to the German Hospital.

1888. Cohen, S. Solis, M.D., Professor of Clinical Medicine and Applied Therapeutics in the Philadelphia Polyclinic; Physician to the Jewish Hospital.

1866. Cruice, R. B., M.D., Surgeon to St. Joseph's Hospital.

ELECTED

1884. CURTIN, R. G., M.D., Lecturer on Physical Diagnosis in the University of Pennsylvania; Assistant Physician to the University Hospital; Physician to the Philadelphia Hospital.

1884. DA COSTA, J. C., M.D., Gynecologist to the Jefferson Medical Hospital.

1884. DA COSTA, J. M., M.D., LL.D., Professor of the Principles and Practice of Medicine in the Jefferson Medical College; Physician to the Pennsylvania Hospital; Consulting Physician to the Children's Hospital and the Northern Dispensary.

1887. DALAND, JUDSON, M.D., Instructor in Clinical Medicine in the University of Pennsylvania.

1859. DARRACH, JAMES, M.D., Consulting Surgeon to the Germantown Hospital.

1888. DAVIS, EDWARD P., M.D., Demonstrator of Obstetrics in the Jefferson Medical College.

1874. DEAKYNE, A. C., M.D.

*1870. DEAL, L. J., M.D.

1887. DEAVER, JOHN B., M.D., Demonstrator of Anatomy and Lecturer on Topographical Anatomy in the University of Pennsylvania; Surgeon to the German and St. Mary's Hospitals.

1885. DERCUM, FRANCIS X., M.D., Instructor in Nervous Diseases in the University of Pennsylvania.

1864. DOWNS, R. N., M.D., Consulting Physician to the Germantown Hospital.

1884. DRYSDALE, T. M., M.D.

1864. DUER, EDWARD L., M.D., Accoucheur to the Philadelphia Hospital; Surgeon to the Maternity Hospital; Visiting Physician to the Preston Retreat.

1871. DUHRING, L. A., M.D., Clinical Professor of Skin Diseases to the Hospital of the University of Pennsylvania; Dermatologist to the Philadelphia Hospital; Consulting Physician to the Philadelphia Dispensary for Skin Diseases.

1881. DULLES, CHARLES WINSLOW, M.D., Surgeon to the Out-patient Department of the University of Pennsylvania and of the Presbyterian Hospital.

ELECTED

1863. Dunglison, Richard J., M.D.

*1871. Dunglison, Thomas R., M.D.

1888. Dunn, Thomas D., M.D.

*1849. Dunott, Justus, M.D.

1860. Dunton, William R., M.D., Consulting Physician to the Germantown Hospital.

1882. Edwards, Joseph F., M.D.

*1887. Edwards, William A., M.D.

*1880. Eskridge, J. T., M.D.

1868. Evans, Horace Y., M.D., Physician to the Charity Hospital.

1884. Fenton, Thomas H., M.D.

1866. Fischer, Emil, M.D.

1884. Fisher, Henry M., M.D., Physician to the Episcopal Hospital.

1888. Flick, Lawrence F., M.D.

1862. Forbes, William S., M.D., Professor of Anatomy in the Jefferson Medical College.

1870. Ford, W. H., M.D.

1884. Formad, H. F., M.D., Lecturer on Experimental Pathology and Demonstrator of Morbid Anatomy in the University of Pennsylvania; Pathologist to the Philadelphia Hospital.

1885. Fox, Joseph M., M.D.

1885. Fricke, Albert, M.D.

1873. Gerhard, George S., M.D.

1884. Getchell, F. H., M.D., Obstetric Physician to the Catharine Street Dispensary.

1885. Girvin, Robert M., M.D.

1884. Godey, Harry, M.D.

1868. Goodell, William, M.D., Professor of Clinical Gynecology in the University of Pennsylvania; Consulting Physician to the Lying-in Department of the Northern Dispensary.

ELECTED

1867. Goodman, H. Earnest, M.D., Surgeon to Wills and the Orthopædic Hospitals; Consulting Surgeon to the Maternity Hospital.

1885. Graham, John, M.D.

1870. Grier, M. J., M.D.

1883. Griffith, J. P. Crozer, M.D., Instructor in Clinical Medicine in the University of Pennsylvania, and Assistant Physician to the Hospital of the same; Physician to St. Agnes' Hospital and Pathologist to the Presbyterian Hospital.

1842. Griscom, John D., M.D.

1883. Gross, Ferdinand H., Surgeon to the German Hospital.

1868. Gross, Samuel W., M.D., LL.D., Professor of the Principles of Surgery and Clinical Surgery in the Jefferson Medical College.

1871. Grove, John H., M.D., Surgeon to St. Mary's and St. Agnes' Hospitals.

1863. Hall, A. Douglass, M.D., Surgeon to Wills Hospital.

*1859. Hammond, William A., M.D., Surgeon-General U. S. A. Retired.

1886. Hansell, Howard F., M.D., Adjunct Professor of Diseases of the Eye in the Philadelphia Polyclinic; Ophthalmic and Aural Surgeon to the Southwestern Hospital.

1865. Harlan, George C., M.D., Surgeon to Wills Hospital; Aural Surgeon to the Pennsylvania Hospital.

1863. Harlow, Lewis D., M.D.

1862. Harris, Robert P., M.D.

1885. Harte, Richard H., M.D., Demonstrator of Osteology in the University of Pennsylvania; Surgeon to the Out-patient Department Pennsylvania Hospital; Assistant Surgeon to the Hospital of the University of Pennsylvania.

1851. Hartshorne, Henry, M.D., LL.D.

1888. Hartzell, Milton B., M.D., Pathologist to the Presbyterian Hospital; Assistant Physician to the Dispensary for Skin Diseases, University of Pennsylvania.

ELECTED

*1849. Hastings, John, M.D.

1872. Hays, I. Minis, M.D.

1882. Hearn, Joseph, M.D., Surgeon to the Hospital of the Jefferson Medical College and to the Philadelphia Hospital.

1884. Henry, Frederick P., M.D., Professor of Clinical Medicine to the Philadelphia Polyclinic; Physician to the Philadelphia Hospital.

1853. Hewson, Addinell, M.D.

1872. Hinkle, A. G. B., M.D.

1888. Hirsh, Abram B., M.D., Chief Assistant to the Surgical Clinic of the Philadelphia Polyclinic, and Adjunct Professor of Orthopædic Surgery to the same.

1888. Hirst, Barton Cooke, M.D., Associate Professor of Obstetrics, University of Pennsylvania; Gynecologist to the Orthopædic Hospital; Obstetrician to the Philadelphia and Maternity Hospitals.

1885. Holland, James W., M.D., Professor of Chemistry in the Jefferson Medical College.

1879. Hopkins, William Barton, M.D., Surgeon to the Episcopal Hospital, and to the Out-patient Department of the Pennsylvania Hospital.

1867. Horn, George H., M.D.

1888. Horwitz, Orville, M.D.

1884. Horwitz, Phineas J., M.D.

1868. Howell, Samuel B., M.D., Professor of Mineralogy and Geology in the University of Pennsylvania.

1881. Huidekoper, Rush Shippen, M.D., Professor of Internal Pathology and Contagious Diseases in the Veterinary Department of the University of Pennsylvania.

1884. Hunt, J. Gibbons, M.D.

1854. Hunt, William, M.D., Surgeon to the Pennsylvania and the Orthopædic Hospitals.

1863. Hutchinson, James H., M.D., Physician to the Pennsylvania and the Children's Hospitals.

ELECTED

1871. Ingham, James V., M.D.

1885. Jackson, Edward, M.D., Adjunct Professor of Diseases of the Eye in the Philadelphia Polyclinic.

1887. Jayne, Horace, M.D., Professor of Vertebrate Morphology in the Biological Department of the University of Pennsylvania.

*1864. Jones, S. P., M.D.

1885. Judd, Leonardo Da Vinci, M.D.

1867. Judson, Oliver A., M.D.

1886. Jurist, Louis, M.D., Chief of Throat Department Jefferson Medical College Hospital, and Lecturer on Laryngology to the same.

1877. Keating, John M., M.D., Obstetrician to the Philadelphia Hospital; Physician to St. Joseph's Hospital.

1849. Keating, William V., M.D., Physician to St. Joseph's Hospital.

1867. Keen, William W., M.D., Professor of the Principles and Practice of Surgery in the Woman's Medical College; Surgeon to St. Mary's Hospital and the Philadelphia Home for Incurables.

1887. Kelly, Howard A., M.D., Associate Professor of Obstetrics in the University of Pennsylvania; Gynecologist to the North Fourth Street Dispensary, Philadelphia.

*1844. King, Charles R., M.D.

1875. Kirkbride, Joseph J., M.D.

*1865. La Roche, C. Percy, M.D.

1887. Leaman, Henry, M.D.

1883. Leffmann, Henry, M.D., Professor of Chemistry and Metallurgy to the Pennsylvania College of Dental Surgery and the Wagner Free Institute of Science.

ELECTED

1851. LEIDY, JOSEPH, M.D., Professor of Anatomy in the University of Pennsylvania.

1885. LEIDY, PHILIP, M.D.

1855. LEWIS, FRANCIS W., M.D.

1877. LEWIS, MORRIS J., M.D., Physician to the Children's Hospital; Assistant Physician to the Orthopædic Hospital and Infirmary for Nervous Diseases.

1849. LEWIS, SAMUEL, M.D.

1886. LLOYD, J. HENDRIE, M.D., Instructor in Electro-Therapeutics in the University of Pennsylvania; Physician-in-Charge of Home for Crippled Children.

1877. LONGSTRETH, MORRIS, M.D., Lecturer on Pathological Anatomy in the Jefferson Medical College; Physician and Pathologist to the Pennsylvania Hospital.

1886. MACCOY, ALEXANDER, M.D., Lecturer on Laryngoscopy, Rhinoscopy, and Diseases of the Throat and Nose in the Woman's Medical College of Philadelphia.

1875. MCCLELLAN, GEORGE, M.D., Surgeon to the Philadelphia Hospital.

1871. MCFERRAN, J. A., M.D., Physician to the Gynecological Hospital and Infirmary for Diseases of Children.

*1885. MALLET, JOHN W., M.D.

1887. MASSEY, ISAAC, M.D., Surgeon to the Pennsylvania Railroad.

*1850. MAYER, EDWARD R., M.D.

1885. MAYS, THOMAS J., M.D.

1868. MEARS, J. EWING, M.D., Professor of Anatomy and Clinical Surgery in the Pennsylvania College of Dental Surgery; Demonstrator of Surgery in the Jefferson Medical College and Gynecologist to the Hospital of the same; Surgeon to St. Mary's Hospital.

1875. MEIGS, ARTHUR V., M.D., Physician to the Pennsylvania and the Children's Hospitals; Consulting Physician to the Pennsylvania Institution for the Instruction of the Blind.

ELECTED

*1884. Mifflin, Houston, M.D.

1881. Mills, Charles K., M.D., Professor of Diseases of the Mind and Nervous System in the Philadelphia Polyclinic; Lecturer on Mental Diseases in the University of Pennsylvania; Neurologist to the Philadelphia Hospital and Consulting Physician to the Department for the Insane of the Philadelphia Hospital.

1888. Mitchell, John K., M.D., Instructor in Clinical Medicine in the University of Pennsylvania; Attending Physician to St. Mary's Hospital; Assistant Physician to the University Hospital and Infirmary for Nervous Diseases.

1856. Mitchell, S. Weir, M.D., Physician to the Orthopædic Hospital and Infirmary for Nervous Diseases; Consulting Physician to the Maternity Hospital.

1882. Montgomery, Edward E., M.D., Professor of Gynecology and Clinical Gynecology in the Medico-Chirurgical College; Obstetrician to the Philadelphia Hospital.

1863. Morehouse, George R., M.D., Physician to St. Joseph's Hospital.

1886. Morris, Caspar, M.D., Physician to the Episcopal Hospital.

1883. Morris, Henry, M.D.

1856. Morris, J. Cheston, M.D., Consulting Physician to the Mission Hospital.

1861. Morton, Thomas G., M.D., Surgeon to the Pennsylvania and the Orthopædic Hospitals; Consulting Surgeon to the Jewish Hospital; Emeritus Surgeon to Wills Hospital.

1864. Moss, William, M.D.

1882. Musser, John H., M.D., Chief of the Medical Dispensary of the Hospital of the University of Pennsylvania; Physician to the Philadelphia Hospital.

1886. Neff, Joseph F., M.D.

1877. Neilson, Thomas Rundle, M.D., Surgeon to the Episcopal Hospital; Instructor in Venereal Diseases and Assistant

ELECTED

Demonstrator of Anatomy in the University of Pennsylvania and Chief of the Venereal Dispensary in the Hospital of the same.

1869. Norris, Herbert, M.D., Physician to the Catharine Street Dispensary.

1865. Norris, Isaac, Jr., M.D.

1866. Norris, William F., M.D., Clinical Professor of Diseases of the Eye in the Hospital of the University of Pennsylvania; Surgeon to Wills Hospital.

1884. Oliver, Charles A., M.D., Ophthalmic Surgeon to St. Agnes', St. Mary's, and the Maternity Hospitals; Visiting Physician and Ophthalmologist to the State Hospital for the Insane at Norristown.

1884. O'Neill, J. W., M.D.

1885. Osler, William, M.D., Professor of Clinical Medicine in the University of Pennsylvania.

1858. Packard, John H., M.D., Surgeon to the Pennsylvania and St. Joseph's Hospitals.

1864. Pancoast, William H., M.D., Professor of Anatomy in the Medico-Chirurgical College; Consulting Surgeon to the Charity Hospital and to the Pennsylvania Free Dispensary for Skin Diseases.

1882. Parish, William H., M.D., Professor of Anatomy in the Woman's Medical College; Obstetrician to the Philadelphia Hospital.

*1854. Parrish, Joseph, M.D.

1883. Parvin, Theophilus, M.D., Professor of Obstetrics and Diseases of Women and Children in the Jefferson Medical College.

1854. Penrose, R. A. F., M.D., LL.D., Emeritus Professor of Obstetrics and Diseases of Women and Children in the University of Pennsylvania; Consulting Obstetrician to the

ELECTED

Maternity Hospital; Visiting Physician to the Preston Retreat.

1868. Pepper, William, M.D., LL.D., Provost of the University of Pennsylvania and Professor of the Theory and Practice of Medicine in the same.

1884. Perkins, Francis M., M.D., Ophthalmic and Aural Surgeon to the Dispensary Department of St. Mary's Hospital; Visiting Ophthalmic Surgeon to the Hospital of the Good Shepherd at Radnor.

1883. Piersol, George A., M.D., Demonstrator of Normal Histology in the University of Pennsylvania.

1872. Porter, William G., M.D., Surgeon to the Presbyterian and to the Philadelphia Hospitals.

1885. Potter, Thomas C., M.D.

1887. Price, Jacob, M.D.

1887. Reed, Charles H., M.D.

1866. Reed, Thomas B., M.D., Surgeon to the Presbyterian Hospital.

1842. Reese, John J., M.D., Professor of Medical Jurisprudence in the University of Pennsylvania; Physician to the St. Joseph's and Gynecological Hospitals and Infirmary for Diseases of Children.

1885. Reichert, Edward T., M.D., Professor of Physiology in the University of Pennsylvania.

*1884. Rex, Francis M., M.D.

1888. Rex, George A., M.D.

1883. Rex, Oliver P., M.D., Physician to the Jefferson Medical College Hospital.

*1857. Richardson, Tobias G., M.D.

1882. Roberts, A. Sydney, M.D., Instructor in Orthopædic Surgery in the University of Pennsylvania.

1878. Roberts, John B., M.D., Professor of Applied Anatomy and Operative Surgery in the Philadelphia Polyclinic; Surgeon to St. Mary's Hospital.

ELECTED

1888. Robins, Robert P., M.D., Visiting Physician to the Dispensary of the House of Industry, the Church Home for Children, and the Board of Guardians of the Poor; Instructor in Physical Diagnosis in the University of Pennsylvania; Lecturer on Chemistry in the Episcopal Academy.

1843. Rodman, Lewis, M.D., Visiting Physician to the Preston Retreat.

1838. Ruschenberger, W. S. W., M.D., Medical Director U. S. N.

*1852. Sargent, Fitz William, M.D.

*1864. Sargent, Winthrop, M.D.

1866. Schaffer, Charles, M.D., Professor of Botany in the Pennsylvania Horticultural Society.

1870. Schell, Henry S., M.D.

1877. De Schweinitz, George E., M.D., Ophthalmic Surgeon to the Children's Hospital; Ophthalmologist to the Orthopædic Hospital; Assistant Surgeon to the Dispensary for Diseases of the Eye in the University of Pennsylvania.

1888. Seltzer, Charles M., M.D.

1875. Seyfert, Theodore H., M.D., Physician to the Gynecological Hospital and Infirmary for Diseases of Children.

1884. Shaffner, Charles, M.D.

1877. Shakespeare, Edward O., M.D., Lecturer on Refraction and Accommodation of the Eye and on Operative Surgery in the University of Pennsylvania; Pathologist and Ophthalmologist to the Philadelphia Hospital.

1868. Shapleigh, E. B., M.D.

1876. Shippen, Edward, M.D., U. S. N.

1880. Simes, J. H. C., M.D., Professor of Genito-Urinary and Venereal Diseases in the Philadelphia Polyclinic; Surgeon to the Episcopal Hospital.

1873. Simpson, James, M.D., Physician to St. Mary's Hospital.

1872. Sinkler, Wharton, M.D., Physician to the Orthopœdic Hospital and Infirmary for Nervous Diseases.

*1863. Smith, A. K., M.D., U. S. A.

*1864. Smith, Edward A., M.D.

ELECTED

*1856. Smith, R. K., M.D.

1884. Smith, Robert Meade, M.D., Professor of Comparative Physiology in the University of Pennsylvania.

1875. Starr, Louis, M.D., Physician to the Children's Hospital; Clinical Professor of Diseases of Children in the University of Pennsylvania.

1884. Stelwagon, Henry W., M.D., Chief of the Dispensary for Diseases of the Skin of the University of Pennsylvania; Physician to the Philadelphia Dispensary for Skin Diseases; Dermatologist to the Northern Dispensary, Howard and Philadelphia Hospitals; Lecturer on Dermatology in the Woman's Medical College.

1888. Stewart, David D., M.D., Chief of the Medical Clinic of Jefferson Medical College and Lecturer on Diseases of the Spinal Cord in the same; Physician to St. Christopher's Hospital.

1842. Stillé, Alfred, M.D., LL.D., Emeritus Professor of the Theory and Practice of Medicine in the University of Pennsylvania; Consulting Physician to the Maternity Hospital.

1846. Stocker, Anthony E., M.D.

1871. Strawbridge, George, M.D., Clinical Professor of Diseases of the Ear in the Hospital of the University of Pennsylvania; Surgeon to Wills Hospital; Ophthalmic Surgeon to the Presbyterian Hospital; Surgeon to the Eye and Ear Department of the Philadelphia Dispensary.

1884. Stryker, S. S., M.D., Obstetrician to the Philadelphia Hospital.

1886. Taylor, John Madison, M.D., Physician to Howard Hospital; Assistant Physician to the Children's Hospital.

1867. Taylor, R. R., M.D.

1887. Taylor, William J., M.D.

1886. Taylor, William L., M.D., Lecturer on Clinical Gynecology in the University of Pennsylvania and Chief of the Clinic and Assistant Gynecologist to the Hospital of the same; Surgeon-in-Chief to the Beacon Service for Women.

1867. Thomas, Charles H., M.D., Surgeon to the Philadelphia Hospital.

ELECTED

1869. Thomson, William, M.D., Honorary Professor of Ophthalmology in the Jefferson Medical College and Ophthalmic Surgeon to the Hospital of the same.

*1854. Tilden, W. P., M.D.

*1870. Turner, A. Paul, M.D.

1866. Tyson, James, M.D., Professor of General Pathology and Morbid Anatomy in the University of Pennsylvania; Physician to the Philadelphia Hospital.

*1852. Tyson, James L., M.D.

1864. Vandyke, E. B., M.D.

1873. Van Harlingen, Arthur, M.D., Professor of Diseases of the Skin in the Philadelphia Polyclinic; Consulting Physician to the Dispensary for Skin Diseases; Dermatologist to the Howard Hospital.

1883. Vinton, Charles Harrod, M.D.

1885. Walker, James B., M.D., Professor of Practice of Medicine Woman's Medical College, Pennsylvania; Attending Physician Philadelphia Hospital; Lecturer on Clinical Medicine and Consulting Physician to the Woman's Hospital.

1886. Watson, E. W., M.D.

1875. Webb, William H., M.D.

1883. Welch, William M., M.D., Physician to the Municipal Hospital for Contagious Diseases.

1884. Wharton, H. R., M.D., Surgeon to the Children's Hospital; Instructor in Clinical Surgery in the University of Pennsylvania and Assistant Surgeon to the Hospital of the same; Attending Physician to the Pennsylvania Institution for the Deaf and Dumb.

1883. Whelen, Alfred, M.D.

1878. White, J. William, M.D., Demonstrator of Surgery and Clinical Professor of Genito-Urinary Diseases in the University of Pennsylvania; Surgeon to the Philadelphia Hospital.

1880. Willard, DeForest, M.D., Lecturer on Orthopædic Surgery in the University of Pennsylvania; Surgeon to the Presby-

ELECTED

terian Hospital; Consulting Surgeon to the Home for Crippled Children.

*1878. Williamson, Jesse, M.D.

1851. Wilson, Ellwood. M.D., Consulting Physician to the Philadelphia Lying-in Charity; Visiting Physician to the Preston Retreat.

1881. Wilson, H. Augustus, M.D.

1874. Wilson, James C., M.D., Lecturer on Physical Diagnosis in the Jefferson Medical College and Physician to the Hospital of the same and to the Philadelphia Hospital.

1887. Wilson, James F., M.D.

1884. Wirgman, Charles, M.D.

1852. Wister, Owen Jones, M.D., Consulting Surgeon to the Germantown Hospital.

1865. Wood, Horatio C., M.D., Professor of Materia Medica, Pharmacy and General Therapeutics in the University of Pennsylvania, and Clinical Professor of Diseases of the Nervous System in the Hospital of the same.

1880. Woodbury, Frank, M.D., Professor of Materia Medica and Therapeutics in the Medico-Chirurgical College of Philadelphia; Physician to the German Hospital.

1866. Woods, D. F., M.D., Physician to the Presbyterian Hospital.

1888. Woodward, Charles E., M.D., Physician to the Chester Co. Prison and West Chester Board of Health.

1878. Wormley, Theodore G., M.D., LL.D., Professor of Chemistry in the University of Pennsylvania.

1860. Wurts, Charles Stewart, M.D.

1861. Yarrow, Thomas J., M.D.

*1840. Zantzinger, William S., M.D.

1887. Zeigler, Walter M. L., M.D.

[It is particularly requested that any change of appointment, etc., may be communicated to the Committee of Publication before the first of November, in each year, in order that the above list may be made as correct as possible.]

ASSOCIATE FELLOWS.

[Limited to Fifty, of whom Twenty may be Foreigners.]

ELECTED

1873. Acland, Henry W., M.D., F.R.S., Oxford, England.
1876. Barker, Fordyce, M.D., New York.
1877. Barnes, Robert, M.D., London, England.
1876. Bigelow, Henry J., M.D., Boston, Massachusetts.
1876. Billings, John S., M.D., U. S. A., Washington, D. C.
1876. Bowditch, Henry I., M.D., Boston, Massachusetts.
1886. Bowditch, Henry P., M.D., Boston, Massachusetts.
1865. Butcher, R. G., M.D., M.R.C.S., Dublin, Ireland.
1877. Byford, William H., M.D., Chicago, Illinois.
1877. Chaille, Stanford E., M.D., New Orleans, Louisiana.
1886. Cheever, David W., M.D., Boston, Massachusetts.
1876. Comegys, C. G., M.D., Cincinnati, Ohio.
1876. Corson, Hiram, M.D., Norristown, Pennsylvania.
1876. Davis, N. S., M.D., Chicago, Illinois.
1876. Donaldson, F., M.D., Baltimore, Maryland.
1886. Draper, William H., M.D., New York.
1883. Fayrer, Sir Joseph, M.D., LL.D., F.R.S., London, England.
1876. Green, Traill, M.D., Easton, Pennsylvania.
1883. Heath, Christopher, F.R.C.S., London, England.
1874. Jackson, J. Hughlings, M.D., London, England.
1876. Johnson, George, M.D., F.R.S., London, England.
1876. Johnston, Christopher, M.D., Baltimore, Maryland.
1876. Jones, Joseph, M.D., New Orleans, Louisiana.
1876. King, James, M.D., Pittsburg, Pennsylvania.
1876. Kinloch, R. A., M.D., Charleston, South Carolina.
1877. Lister, Sir Joseph, Bart., M.D., LL.D., F.R.S., London, England.
1865. Macleod, G. H. B., M.D., Glasgow, Scotland.
1886. McGuire, Hunter, M.D., Richmond, Virginia.

ELECTED

1876. Moore, E. M., M.D., Rochester, New York.
1876. Mowry, R. B., M.D., Allegheny City, Pennsylvania.
1873. Ogle, John W., M.D., London, England.
1874. Paget, Sir James, Bart., M.D., LL.D., F.R.S., D.C.L., London, England.
1876. Pollock, A.M., M.D., Pittsburg, Pennsylvania.
1876. Porcher, F. Peyre, M.D., Charleston, South Carolina.
1886. Reeve, John C., M.D., Dayton, Ohio.
1886. Senn, Nicholas, M.D., Milwaukee, Wisconsin.
1886. Shattuck, George C., M.D., Boston, Massachusetts.
1886. Thomas, T. Gaillard, M.D., New York.
1869. Valcourt, Th. de, M.D., Cannes, France.
1886. Whittaker, James T., M.D., Cincinnati, Ohio.
1886. Yandell, David W., M.D., Louisville, Kentucky.

CORRESPONDING MEMBERS.

ELECTED

1880. Carrow, Fleming, M.D., United States.
1880. Chiara, Domenico, M.D., Florence, Italy.
1886. Dey, Kanny Loll, M.D., Calcutta, India.
1885. Rendu, Jean, M.D., Lyons, France.
1886. Richards, Vincent, Goalunda, India.
1880. Wasseige, Adolph, M.D., Liege, Belgium.

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NOTICE.

THE present volume of TRANSACTIONS contains the papers read before the College from July, 1887, to December, 1888, inclusive.

The Committee of Publication thinks it proper to say that the College holds itself in no way responsible for the statements, reasonings, or opinions set forth in the various papers published in its Transactions.

[The first portion of Volume X. of the Third Series of the Transactions has been edited by DR. J. EWING MEARS. The remainder by DR. J. P. CROZER GRIFFITH.]

BIOGRAPHICAL SKETCH

OF

CASPAR MORRIS, M.D.

By

J. CHESTON MORRIS, M.D.

[Read November 2, 1887.]

It is not so easy, as one might think who has never tried, to imagine the circumstances and surroundings of life in this city at the beginning of this century. Philadelphia, though founded over a hundred years previously, and at that time the largest city of the New World, was still in a condition which we should now consider intermediate between a series of large villages and a town of some size—or rather, a town of considerable size surrounded by straggling villages, since incorporated with it. Its population of 67,000, housed in 9000 good dwellings occupying the district lying along the Delaware between Vine and South Streets and extending as far west as Sixth or Seventh Street, was composed largely of Friends, Episcopalians, Presbyterians, and others mainly of English and Swedish origin, together with German and French refugees who had sought shelter here at various times from the oppressions and conflicts of the Old World, where they might

enjoy the greatest possible freedom of thought and action consistent with the maintenance of social order and justice. To mention such names as those of Priestley, Pym, Zinzendorf, Rittenhouse, Franklin, Hopkinson, Rush, and Wistar, will be sufficient to give an idea of the intellectual elements which went to the formation of the mode of thought of the Province of Pennsylvania. It was no mere accident of central position which made Philadelphia the spot chosen for the assemblage of the representatives of the Colonies when they came together to consider what was to be done for the redress of their grievances and the future development of their country. On the contrary, it was then as now to a certain extent the centre of orderly thought and quiet but determined material progress. Here were to be found the leaders of every phase of opinion; and the various schools and colleges struggling nobly for existence and advancement amidst all the difficulties and disadvantages incident to an almost frontier life, and with the effervescence necessarily arising from clashing views, gave rise to a race of men habituated to searching far down into the nature of things that they might reach sure foundations on which to base their opinions and build the fabric of their lives. The successful close of the Revolutionary War and the inauguration of the new government were followed by an expansion of ideas of life, and of commerce.

Such was the condition of affairs when Caspar Morris, the subject of this memoir, was born, May 2, 1805. He was the third son of Israel W. Morris, a broker and commission merchant, and his wife Mary, the daughter of Levi Hollingsworth, who was also a leading and enterprising merchant, and who lived in a stone house still standing on the west side of Dock Street above Front, while his counting-house and warehouses occupied a large space on the wharf adjacent, extending below Spruce

Street. Mr. Hollingsworth was largely engaged not only in domestic but also in foreign trade with England and France; was a genial man of the highest probity, very highly esteemed by his contemporaries for these qualities. and for his inflexible and courageous maintenance of what he held right, noble, and true. His selection by Washington to carry a considerable sum of money through the wilderness to the troops in Canada under General Montgomery, in 1777, and his conduct when half mutinous and starving citizens tried to seize flour which was in his care, designed for the army, may be cited as characteristic of him. No less decided a woman was his wife, Hannah, a Christian lady of culture and refinement, the daughter of Stephen Paschall, who was by occupation a whitesmith and had his shop at Third and Walnut Streets. He was a zealous student of natural philosophy, alchemy, chemistry, and metallurgy, and possessed a library rich in all the then attainable works on these subjects. A small part of these works, together with some of his note-books, are now in my possession and show him to have been a man of deep reading and earnest thought. As a patriot he was engaged in casting cannon for the United States, and in the construction of the "chevaux-de-frise" in the Delaware. He was a proficient in the tempering of steel, and his manufactures bore a high repute; it is said that the British officers, during the occupation of Philadelphia, declared there were "no swords as good as those of the old Quaker," and furnished themselves accordingly. His test of a blade was to thrust the point into the counter of his shop and bend the heel over until it touched the board; if the blade snapped, or was warped, it was condemned. He accumulated a competence by the employment of his skill and science. It is related of him that Mr. Horace Binney, then a young man boarding at the same house with him, accosted him thus one

day: "Mr. Paschall, I hear you have discovered the philosopher's stone!" The old gentleman replied, "I have passed many years of my life in a pursuit which has yielded me peace, happiness, and comfort: have I not found it?" His daughter inherited many of his traits of character. She was an earnest Christian woman, and looked with dread upon the views of Voltaire and Rousseau, and the horrors of the French Revolution; while her husband, Mr. Hollingsworth, was able to see good coming even out of the iconoclasm of old forms and modes, and was an admirer of the genius of Napoleon. Many and warm were the discussions on passing events which the children and grandchildren heard, and which tended to awaken in them the study of the rights of man, and of his duties too. Mr. Hollingsworth was also an ardent admirer and personal friend of General Washington, and was a member of the Philadelphia Troop of Light Horse, which acted as the General's bodyguard during the War of the Revolution. The night after the battle of Princeton and before that of Monmouth the headquarters were at a farm-house in New Jersey. Mr. Hollingsworth being off duty, and finding his quarters in the mansion disagreeable, crawled into a corncrib in the barnyard and lay there. After a while, hearing a step and calling out "Who goes there?" he was greeted by Washington, who, after giving the password, said, "Mr. Hollingsworth, you and I have been well enough brought up to prefer clean straw to dirty beds," and crawled in also and passed the rest of the night there.

I have thus endeavored hastily and briefly to sketch the characters of some of the ancestors of Caspar Morris, as they had much influence in moulding him for his life-work. But I should leave this part of my task very incomplete were I to say nothing of his paternal ancestry. On the map of Philadelphia

in 1705, may be seen the brewhouse of Anthony Morris, the second of that name, who was one of the original settlers, a leading and distinguished Quaker preacher, but liberal enough to allow the use of his brewhouse to the Baptists for their meetings. His son, Anthony, third, was Sheriff; and his grandson Anthony, fourth, was repeatedly Mayor, a post of honor to which he finally declined re-election. The eldest son of the latter, Major Anthony Morris, was killed at the battle of Princeton. His second son Samuel was an active and leading citizen of great geniality and a high sense of honor, a man universally beloved and respected by his associates. As Captain of the Philadelphia Troop of Light Horse, and personally intimate with Washington, at whose table a plate was always placed for him during the war, as President of the Gloucester Fox-hunting Club, and as Governor of the "State in Schuylkill" (better now known as the Fish House Club), he has left a social memory which is still green. His business was that of a sugar baker or refiner, the firm Morris and Miercken occupying for this purpose a building on Shippen (now Bainbridge) Street above Second, which is still used in the manufacture of rock candy and syrups.

The antecedents and surroundings of the youthful Caspar were, therefore, those of wealth, culture, education, and refined thought. His father, Israel W. Morris, was a man of great determination and energy, of large and generous views; he was the youngest of a large family. His mother was a lovely Christian lady of decidedly poetic temperament and of literary ability. Early in life both Mr. and Mrs. Morris became sincere and devoted Christians, and determined that they would rear their children, not for the fashions and vanities of the world, but in simplicity, earnestness, and truth, to labor with their own hands or minds in that sphere of life in which

God should place them, so as to make of themselves useful citizens, and humble earnest servants of God. To carry out this plan, when Caspar was but a few years old, they removed to a farm about five miles from Market St. bridge near the Lancaster turnpike. Here their children were reared in thrift and industry, made all the more necessary by the financial storms and wrecks which overspread the country from 1808 to 1820. The various avocations of farm life demanded the energies of each one to contribute to the general weal according to his or her power. At one time Caspar accompanied the farmer's wife, standing in a stall in the Second St. Market selling the farm produce on market days. But their education was not neglected. Amid her household duties and the cares of her large family, their mother never neglected to inspire in them all a love of that which she had found so precious, a love of the beauties of nature, the trust which looks from nature up to nature's God, and the habit of storing the mind with the gems of thought to be met with in the writings of the best authors. Her purity of thought and high, noble aim, her refinement of character, and practical active usefulness and benevolence were the traits which, with her devoted mother-love, her children have ever dwelt upon. Their first loss, sad and irreparable, was her death, June 23, 1820, after an illness of only a few hours, when Caspar was but fifteen years old. But her memory was to him, as to all her children, ever as a guiding star.

In winter Caspar, with his brothers and sisters, was at first sent to school at Pine St. Meeting-house, subsequently to David Dulles in Church Alley, then to the William Penn Charter School under the charge of Thomas Dugdale and Joseph Roberts, of whom he always spoke with high regard. As the boys attained a suitable age they were apprenticed or articled,

as the custom then was, for the various trades or professions chosen by themselves and deemed appropriate by their parents, who wisely thought no one fitted to command who had not first learned to obey, or to conduct any business with the minute details of which he is unacquainted. How successful was the training thus given, and what principles were inculcated, may be judged when we recall these young men as the founders of the houses of Stephen P. Morris & Co., afterward Morris, Tasker & Morris, of Levi Morris & Co., afterward Isaac P. Morris & Co., and Morris & Jones, now Morris, Wheeler & Co.

Caspar, having early shown medical tastes and proclivities, and having received a legacy as namesake of his great-grandfather Caspar Wistar (the ancestor also of the illustrious anatomist of that name who was at that time Professor in the University of Pennsylvania), was destined for the medical profession. During his school and student years, which were from 1819 to 1826, except during his term as Resident at the Pennsylvania Hospital, he resided much with his grandparents, Mr. and Mrs. Hollingsworth. He entered the office of Dr. Joseph Parrish, then the leading practitioner in the city, and, as part of the usual course of study, was employed for some months in a drug store. He graduated in 1826, his thesis being on the practice of medicine. Several amusing and instructive incidents of this period may be given as illustrations of his character and of the times. He had a horror of surgery from an instinctive dread of giving pain—think of what surgery was before the days of anæsthetics—and also from a too great lack of confidence in his own abilities (too rare a trait); and so great was his dread of failure in his examination on this branch that he rode on horseback to the professor's door, determined that if unsuccessful he would ride

off, not to be heard of more! Another anecdote, however, may illustrate his character better. During his term at the Pennsylvania Hospital a young man, B. L., was brought in suffering from fracture of the base of the skull and also fracture of both parietal and the frontal bones with compression and loss of brain matter and hemorrhage from ear and nose. I have his carefully taken notes of this case which illustrate curiously the surgery of the day. It was successful, however; the young man recovered, and some years afterward made a will leaving his skull to the young doctor who had cared so faithfully for him. Thirty years after, on the death of B. L., the skull came into my possession; the diagnosis was verified, and the skull is now deposited in the museum of the College, while the history of the case is given in the *Transactions*. I may add also an incident of his student days of which I have been reminded by Dr. Ruschenberger. A fellow-student, a stranger, without friends in the city, was taken ill at a boarding-house with smallpox. Caspar asked and obtained leave from his grandparents to bring him to their house, which he did, and nursed him faithfully. At his request, Dr. Chapman kindly visited him until he was restored to health. Then, at the request of the student, Caspar accompanied him to Dr. Chapman's house and asked the latter for his bill. Chapman came forward, and taking hold of him said, "You young rascals! Dog don't eat dog! and if you 're not dogs, you 're puppies." They retired greatly relieved, as the young man's finances were at a low ebb. Another incident of his hospital life I have also heard from himself. I asked him if he had ever seen a case of hydrophobia. He replied, "Yes, when I was resident at the hospital; and I never shall forget the poor man's sufferings, nor his gratitude to me for a small act of

humanity. Everyone was afraid of him; his convulsions were so terrible that he was bound so as to prevent his injuring himself or others during the paroxysms. This dread on the part of others distressed him; he asked me if I too was afraid of him. I said, 'No;' and to assure him stooped over and kissed him."

He also took an active interest and part in the formation of the Historical Society of the State of Pennsylvania, and contributed a paper on the "Early History of Medicine in the Province" to its Proceedings. The minutes of its meetings are in his handwriting from its organization to January, 1827, and some of them were held in his room at the Hospital (was this the "room of the Phrenological Society"?) and yet he does not give his name as an original member. I suppose this must have been because at the organization of the Society he was not of age and, hence, did not feel himself entitled so to do.

Soon after his graduation in 1826, in accordance with the custom of the times, Dr. Morris went on a voyage to India as ship's surgeon and assistant supercargo. He sailed May 8, 1827, on the ship "Pacific," Captain J. Wootten, arriving without adventure at Madras, September 3, 1827. From his journal I extract the following unfinished fragment entitled

LINES TO A FLYING FISH.

Poor silly truant of the briny deep,
With wondrous length of fin, and dark black eye,
What strange idea through thy brain could creep,
To tempt thee such experiment to try?
To stretch thy fins upon the wind—and fly?

Didst wish to know the cause of the commotion
That passed with thundering noise above thy head,
Ploughing deep furrows in the breast of ocean,
Scaring her monsters from their dark-blue bed,
Whilst wide around the foam in whitening sheets is spread?

Didst think some monster from the cheerless North,
Tired of his frozen sea and lengthy nights,
In search of gentler climes had wandered forth
From the dull region of electric lights,
Where winter holds his court, 'mid towering icy heights?

Or didst thou think—his fame has travelled wide—
It was the famous serpent of Nahant
With eyes of flame and death-defying hide,
Come to the South upon a pleasure jaunt,
Or looking out for game when herring shall grow scant?

But soft! perchance deep-seated in thy breast
Some secret longing after hidden good,
Some rankling discontent too deep imprest,
Has fired the scanty current of thy blood,
And in pursuit of bliss thou 'st left thy native flood.

Knowest thou the urgings of intense desire?
Can Hope diffuse her magic o'er thy soul?
Can Fancy warm thee with her genial fire?
Or gay Delusion o'er thy senses roll
Visions of future bliss with unrestrained control?

Ah no! poor trembler—these so boasted joys,
These poisoned sweets, 'tis man's alone to know:
Sirens, they charm him only to destroy;
In magic folds conceal the fatal blow
Which, while they promise bliss, bring but a darker woe!

But since, what'er the motive brought thee here,
Thou thus art brought in company with man—
Still thy wild fluttering, calm each anxious fear,
And ere in death shall close thy shortening span,
Teach him the secrets of the close-mouthed main to scan.

Say, hast thou roamed amidst its caverns wide—
Explored the wonders of its hidden deeps—
Hast seen Behemoth in his scaly pride—
Or where her court the Ocean Empress keeps?

Hast thou, o'erwhelmed in the engulphing deeps,
Forever hidden from man's searching eyes,
Seen where, in righteous judgment ruined, sleeps
A former world with all its pomps and lies,
The glory of its great, and wisdom of its wise?

Perhaps thou hast seen, a thousand fathoms down,
A warning monument of human pride,
Some stately palace in its grandeur frown,
Resisting still the fury of the tide
Which whelms its turrets high, and fills its chambers wide.

Say, hast thou rested in those marble halls
Which sheltered once the monarch of the throng?
But now the echoes of its sculptured walls
Resound no more with laughter, cheer, and song—
There endless silence reigns!

Or hast thou seen where, midst their mirth and wine,
Cheered by the viol and the thoughtless joke,
Or while in wanton maze the dance they twine,
First to the giddy throng in thunder spoke
Th' o'erwhelming flood, outpoured when Ocean's fountains broke?

Or hast thou roamed where, with their kindred dust,
Ashes of generations past were laid,
And seen the storied urn, the speaking bust;
Which, silent now, their solemn trust betrayed,
No longer warn the world what havoc Death has made!

To while away the tedium and monotony of the long sea voyage he undertook the careful study and acquisition of Greek, with the assistance only of a grammar and lexicon, his principal text-book being the Greek New Testament. I can vouch for the information thus gained having been thorough and accurate, and useful to him in after years in training his children. At the same time his spiritual nature was deeply awakened. Always a thoughtful studious boy, though by no means a recluse, his parents' teachings and prayers, and the influence of what he had seen of his grandfather Hollingsworth's life (he had been his patient and untiring nurse for many months through the latter's failing health) bore fruit in his entire dedication of himself to that Master who took upon Himself our infirmities and bare our weaknesses. He proceeded with the ship to Calcutta, where he was a frequent guest at the house of the Rev. Dr. F. A. Goode, and Archdeacon (afterward Bishop) Corrie; and was baptized by Rev. Mr. Wilson, Dr. Corrie's assistant. Of these eminent servants of God, and their kindness to him, he always spoke with the warmest affection. The return voyage was made also uneventfully, and he arrived early in June, 1828.

On November 11, 1829, he married, in Baltimore, Anne, daughter of James Cheston, a merchant of that city, largely engaged in the milling business and the shipment of flour to South America, and importation of coffee. Her mother was Mary A., daughter of Samuel Hollingsworth, a brother of

Levi; they were thus second cousins, and descended from Mr. Henry Cornish, a merchant, and at one time High Sheriff of London, who was executed by order of one of the associates of the infamous Judge Jeffreys, for alleged complicity in the Monmouth plot; and whose daughter was married to Henry Hollingsworth, and came to this country. Henry Hollingsworth assisted as surveyor in the plotting of the city of Philadelphia. They settled near the head of Elk River, and their descendants are numerous.

Immediately on his return from India, he was appointed one of the physicians of the Philadelphia Dispensary. He had intended settling in the neighborhood of Seventh and Arch Streets, near St. James' Episcopal Church, with which he had connected himself. But a poor woman coming from the neighborhood of the brick-yards beyond Broad and Chestnut, carrying her babe suffering from cholera infantum, under the rays of a hot July sun, to the Fifth Street Dispensary, so aroused his sympathies for the mass of poor in that vicinity, who had no good physician, that he gave up what seemed to be a very pleasant opening, and established himself on Broad Street, two doors above Chestnut; moving thence on his marriage to a small house on Chestnut, next door west of the United States Mint, and two years after to a larger one on the south side of Chestnut, below Broad, where he resided until 1847, when he purchased 1428 Chestnut, and resided there until 1870; after his return from Europe, at 1033 Spruce Street, until his death.

The improvement which followed subsequently made this the best part of the city. Very soon a movement was started to erect a large Episcopal church in the vicinity. The first meetings for this purpose were held in his parlor; and from the efforts thus put forth sprang the Church of the Epiphany,

at the corner of Chestnut and Fifteenth. He was also one of the first to move in the establishment of the House of Refuge; and among my earliest recollections are those of accompanying him there during his visits as physician to that institution—a post which he filled from 1830 to 1834.

He was an active member of the Academy of Natural Sciences from 1829 to 1838: and of the American Philosophical Society from 1857 to 1860. In conjunction with Mr. Roberts Vaux, Mr. J. Francis Fisher, and others, he made earnest and at length successful efforts for the establishment of the Pennsylvania Institution for the Blind, of which he was one of the most active spirits; he became at first physician, then manager in 1833, and continued to serve as manager subsequently until his death. He was also active in the affairs of the Protestant Episcopal Church, being a member of the conventions, and participating largely in all movements in that body. Among his earliest efforts in the cause of evangelical religion was a correspondence with Bishop White on the subject of baptism. Born a Quaker, but convinced of the necessity and propriety of that ordinance, he addressed to the Bishop a series of questions, so as to draw from him an authoritative statement of his views and those of the Episcopal Church as to the propriety of rebaptizing members of other denominations. He was no narrow sectarian, and though he loved the church of his adoption with all his heart, he saw and felt the good in other denominations so strongly that he loved to associate with them. Toward the Society of Friends especially he felt so warmly (and increasingly so in his later years) that he often attended their meetings. Lest any one should think that it was fear of the outward badge of plainness of garb which had induced him to leave that body, he continued for many years to wear a Friend's coat.

As a citizen he was earnest and persistent in performing all his duties, when even voting was a matter often attended with personal inconvenience and sometimes peril. He knew not what fear or hesitation was when impelled to do what he thought was right, and took sides earnestly and strongly. On one occasion coming toward home late at night, a window of a large house on Chestnut street was thrown up, and a lady screamed for help. Her maniac father had a pistol, and was threatening her life. She threw him the key of the front door; without a moment's hesitation he opened the door and rushed up the stairs to meet the maniac standing at the top with the pistol levelled at him. To grasp it, avert the barrel and struggle till he gained possession of it, were but the work of a few moments, but he did not quit the house till "order reigned in Warsaw." The pistol remained many years in his possession.

That his impetuosity sometimes got the better of his judgment may be inferred from the following incident. In order to insure the sanctity and quiet of the Sabbath, chains were placed across the streets in front of churches and meeting houses during the hours of service. The posts to which such chains were fastened remained quite recently in front of the First Presbyterian Church, Washington Square. While this may have been well when the city was small, it grew to be a great obstruction as the population increased—and doctors found great inconvenience in visiting their patients during church hours. But the rigid Sabbatarians would not give way. Sometimes the ropes or chains were cut, or driven over —and on one occasion this was done, or attempted, by Dr. Morris, who was thereupon arrested and carried before Mayor Watson. He was fined for breach of the city ordinances— and so indignant was his protest that the Mayor fined him

additionally for his disrespect to the court. He paid his fine, and went away a wiser man—but not without the sincere respect and friendship of the Mayor, who became and remained his patient, and warm personal friend.

But amidst all other calls of duty as a citizen, a philanthropist, and a Christian, he never forgot or neglected his one great business—that of the physician. Unflagging, never seeming to weary day or night, constant and faithful, he watched his patients, nursed them, I might truly say, and was (how many can still testify to this!) the comfort and stay of their lives and their guide to the "realm where there is no sickness or sorrow, no more death." Utterly unselfish, he sought his pleasure in the happiness or health of others, regardless of his own. Those who did not know him will find it hard to believe that I am not carried away by a feeling of filial regard in thus depicting him. Yet I feel and know that I can draw but a faint picture of his earnest busy life during this active period from 1829 to 1871. Of his exertions during the cholera visitation in 1832 I have heard eye witnesses tell. In 1842 he was one of the physicians who went to Columbia in response to a call for aid when that town was visited by cholera, and received afterward a gold-headed cane, voted by the Councils as a grateful memento. Many a time I can recall, when from early morn till late at night he seemed never to rest a moment, snatching a hurried meal at intervals, frequently out at night, writing hastily every spare moment—worn with care and anxiety for those whose sorrows or sufferings he made his own—reading greedily and studying faithfully such books or journals as would aid him in the science or practice of his profession. I never knew such a life of ceaseless activity. Yet he never was in too much hurry to give a kind word or look, or to help some one of us, his children, in

our little difficulties. When he came in and threw himself exhausted on the sofa he would sleep almost instantly, and our most boisterous play would never disturb him; but if a quick or angry word was spoken, he was up in an instant. Careful for us as a sensitive mother would be, he yet enjoyed and encouraged us in all boyish sports and pastimes. I have known him to be "on the go" for weeks at a time without taking off his clothes—except to change them—yet always cheerful, full of life, a happy Christian, and an earnest one. His practice was very large and successful.

He early had the warm friendship and support of Drs. Chapman, James, Mease, Wistar, Physick, Parrish, and of other medical friends. A number of them—Bridges, Carson, Fox, Mütter, Gerhard, Kirkbride, Norris, Peace, Pepper, Rodman, and Stewardson—formed with him the Friday Evening Club and continued for many years to meet at each others' houses. Their very names suggest the earnest scientific character of their lives, and their devotion to their patients. He became a Fellow of this College in 1839, and was elected to its Council in January, 1868, and though not contributing largely in writings, yet never shrank from communicating the results of his experience when he thought he could do so usefully. In 1838 he joined in the formation of the Philadelphia Medical Institute, lecturing until 1844 on Practice. In 1851 he published his Lectures on Scarlet Fever, which at once took rank as one of the best monographs on the subject; and a second edition was published in 1858. His lectures on cholera were also complete and exhaustive of all then known on the subject.

His sympathies were warmly enlisted for the abolition of negro slavery, yet without carrying him into the fanaticism which at that time began to reign. He knew too much of the other side—of how many conscientious masters and mis-

tresses were straining every nerve to do what they could for the poor fellow beings whom they had to care for. Yet the horrors of the system, pushed as it was to the breeding for sale, and the inhuman treatment, of the poor sufferers, galled his very soul and led him to exclaim with Cowper (his favorite poet),

> "I had much rather be myself the slave
> And wear the bonds, than fasten them on him."

He encouraged and joined his wife in freeing the slaves inherited by her from her father, although this was hampered and obstructed by the then existing laws of Maryland.

In 1836, he sailed with his wife and their cousin, Miss Emily Hollingsworth, to Liverpool, and travelled through England and Wales, for the health of his wife. Six months were thus pleasantly passed. In 1841 he wrote and published a Life of William Wilberforce, abridged from that by his sons. In 1847 he also published a Memoir of Miss Margaret Mercer, a lady who had done noble educational work in Maryland and Virginia; of this a second edition was published in 1848. His practice, however, absorbed all his time and faculties, so that, except a few short fugitive poems, we have very little from his pen, which he wielded deftly and rapidly. In 1852 he published, in pamphlet form, a letter to Bishop Potter, on the necessity for increased hospital accommodation in this city. As a result of this, and in consequence of the associated labors of Mr. John Welsh, Bishop Potter, and himself, we now have the Episcopal Hospital. In 1856 he became, for a short time, one of the physicians to the Philadelphia Hospital at Blockley, and delivered lectures there on diseases of children. On the outbreak of the War of the Rebellion all his sympathies, both active and passive, were with the Union cause, though

his many and intimate associations with such friends as Bishop Johns, of Virginia, and others, made it a very painful ordeal to him. His time for active service, however, except at home, was passed, but here he did noble though quiet work. The long and severe strain on his energies told at last, and in 1868 he was prostrated by a severe attack of anthrax—a carbuncle of very large size formed on the nape of the neck. His friend, Dr. Norris, who kindly saw him in consultation with me, said he never had previously seen so large a one prove other than rapidly fatal. He recovered, but his strength and activity were never the same.

In 1871, at the solicitation of his brother, Wistar Morris, he, with his wife, accompanied him and his wife, and their two sisters, in an extended tour through Egypt, the Holy Land, and Europe, lasting nearly two years. His letters written home are delightful, even in these days of travel. But while abroad he did not forget his medical profession, but studied everywhere the subject of hospital administration at every opportunity. It was this, together with his long experience as Manager of the Episcopal Hospital from the time of its organization, which enabled him, at the request of the Board of Managers of the Johns Hopkins Hospital, to contribute the essay on that subject to the volume published by them, which gives in a lucid form the ripe result of his observations. This was the last of his public work. He had retired from general practice when he went abroad, and resumed it only to a very limited extent after his return amongst his old friends and patients, who insisted on his coming to see them. But the anxieties of the profession became very painful to him. He felt but too keenly how little we can accomplish of all that we would, and the responsibility of giving advice became a burden too heavy to bear. His judgment was unimpaired, and

many a time have I availed myself of it without putting him to the suffering caused to him by directly giving advice.

He was never physically strong, though he had such wonderful endurance. In early life his hair was light brown, and complexion clear and slightly ruddy, and his eyes grayish-blue, as shown in a portrait painted when he was twenty-two. He returned from India with very black hair, and slightly sallow complexion, which contrasted strongly with the color of the eyes. He was a handsome man, of light step and easy carriage, with an earnest, thoughtful expression of countenance, but with a cheerful sympathy which made him invaluable in a sick-room. As a physician his views were clear and simple, and his practice directed more to the removal of *laedentia* and free administration of *juvantia*, than to niceties or extravagances, however fashionable. He formed his diagnosis quickly, after a careful, minute examination; and never shrank from telling his patients the truth kindly but firmly, giving them advice simply and clearly; he thus won their entire confidence. If the least doubt remained in his mind, he always urged a consultation with those in whom he or the patients had reason to confide, and was always glad to divide responsibility. He was beloved by all, even by those who differed with him. He carried his Christianity everywhere with him, not wearing it as a cloak, or hiding it for occasional use when convenient, but as that which saturated and permeated his being and his life. Quite recently a member of this College told me of an occasion when Dr. Morris and the late Professor Darrach were both called in consultation to see a difficult and obscure case under his charge; after seeing the patient, they withdrew to another room. Dr. Darrach said, "Doctor, this patient needs higher wisdom than ours." "Let us seek it," replied Dr. Morris, and in an instant both of them were on their knees. The patient

got well. In manner he was cheerful, often vivacious, but never trifling; he was one of the best conversationalists I have ever known, his rich and varied knowledge and experience and hearty sympathy rendering him popular alike with old and young. He kept himself constantly informed of the best that was going on in the world of science and literature, and was himself no mean poet, though none of his writings in that vein would he ever publish. A small volume of *Heart Voices and Home Songs*, printed for private circulation, is all that remains, from which, by request of a Fellow of this College, I add four selections. His strength gradually but steadily declined. Without acute disease, or trouble other than that due to a gouty, feeble heart, which he inherited, he found himself obliged to relinquish active life, and one after another of his cherished employments. In 1880, one year after the celebration of their golden wedding, at which their assembled children and grandchildren made quite a numerous company, his beloved wife passed away, after much suffering, to her rest. And three years after, on March 17, 1884, he also "entered into the joy of his Lord," leaving three sons and a daughter surviving; two children died in infancy.

"Blessed are the dead who die in the Lord."

"Even so, saith the Spirit: for they rest from their labor, and their works do follow them."

SELECTIONS FROM "HEART VOICES AND HOME SONGS."

BY CASPAR MORRIS, M.D.

HEART'S DESIRES.

Not for a cottage in sequestered glen,
With all the softer charms of nature graced,
Where wild flowers breathe their odors gently round—
Not for a cell, on some rude mountain placed,
Far from the haunts of sorrow and of men,
Near where the cataract pours with thundering sound—
No! not for these shall rise my earnest prayer.
But give me, heaven, some humble mansion, where,
Cheered by the converse of a faithful friend,
Taught to approve the appointed lot of care
Thy goodness with our thread of life shall blend,
I may, to man, thy wondrous love declare:
Rear there an altar to thy service high—
Live at my Saviour's feet, and there in triumph die.

1827.

THE WEEPING WILLOW.

(*Planted by Mary Hollingsworth, at Green Hill Farm*, 1797. *Fell* 1857.)

Thou art fallen! thou art fallen! 'tis a mournful sight to see
The crushing of thy glory, thou mother-planted tree!
Thy noble limbs prostrate on earth; thy giant trunk o'erthrown:
Thy symmetry to ruin brought: thy leafy garlands strewn:
My heart is filled with sadness, and my eyes o'erflow with tears,
As I stand amid the utter wreck of twice thirty growing years.

By my mother thou wast planted, in her virgin beauty's prime;
And my father's eye watched o'er thee, in his opening manhood's time.
Thy infant roots were watered well with love's attentive care:
And thy stem was trained and thy boughs were spread to float upon the air:
Still, as year by year thou rose aloft, and more wide thy branches threw,
Thou wert witness of their hallowed love, which with equal vigor grew.

How often, in my childhood, have I sported in thy shade,
And watched with joy the flickering light, as through thy boughs it played:
Even *now* the sounds of gladness leave their music on my ear,
The record of fraternal joys it then was thine to hear,
As a loving and unbroken band, our household gathered still
And year by year yet larger grew, like thy shadow on the hill.
'Twas there, when days were longer grown, and vernal breezes blew,
And day by day thy waving boughs more green and flexile grew;
We rolled and gambolled on the sward, with violets sprinkled o'er,
And gathered golden buttercups, more prized than golden ore:
While hyacinths, and blue-bottles, and daffodils so gay,
Were mingled with narcissus white, and the lily's bright array.

Those spring-time days of life were like that spring-time of the year:
And our hearts poured out their gladsome notes, unconscious of a fear,
Like the birds that carolled on thy boughs, or the breeze that through them played,
Or the gold and emerald checkered work by those waving shadows made:

And graven deeply on these hearts in memory's inmost shrine
Shall ever dwell, O hallowed tree! that beauteous form of thine.

Thy leaves have furnished chaplets to bind our joyous brows,
And in baskets, rudely fashioned, we have twined thy pliant boughs;
How oft I've wished that once again, a true, light-hearted boy,
From thy tender branches I could frame the much-prized whistling toy
Through which my childish spirit poured, in many an accent shrill,
The exuberance of kindling life, which knew not to be still.

When added years, and added powers of body and of mind,
Taught me in loftier efforts still a sterner joy to find,
How oft, with sturdy limbs, I climbed to seek a leafy throne,
And cherished there aspiring hopes of honor and renown:
Or pensively inclined, my form have indolently laid
On boughs, which in the summer breeze with ceaseless motion swayed.

How oft, thus lifted from the world, I have found a happy spot,
In which, forgetful of its care, and by its care forgot,
Full many an hour of joy has passed, in holy converse high
With those whose works surviving prove their immortality!
With Beattie climbed the steep where Fame's proud temple shines afar:—
With Milton mingled in the scenes where angels wildly war:—

With Cowper gazed upon the meads, through which the vagrant Ouse
Wanders, as though reluctant still its flower-clad banks to lose:—

With Goldsmith travelled far, yet still retained a love for home,
In whose fair picture still thy form, thou sacred tree, would come;—
While Johnson, Addison, and Steele, their classic language poured,
Fraught with those precious gems of thought my memory still holds stored.

In manhood's day, when duty's voice has called me to the strife,
The ceaseless struggle, and the toil we vainly call our life;
When powers o'erstrained have traitorous proved, and fainting in the heat
Have bid me lay the burden down, and in some cool retreat
Seek for renewal of their tone, thy pendant, waving bough,
As its shadow on my vision fell, ever smoothed the knitted brow.

No sound was by those branches made, as noiselessly they swept
The verdant surface of the lawn; yet a music from them crept,
Whose holy, softened cadences, like the distant Sabbath-bell,
Or the warbling of the morning, came with soul-subduing swell;
And many a pool of bitterness has been healed by branch of thee,
As it played across my troubled soul, thou consecrated tree!

In my early childhood's blithesome days of confidence and hope,
I have seen my parents' parents, as they rested on this slope
Beneath thy cherished shadow, and bade us look to thee
With affection's tenderest glances, thou mother-planted tree!
To *my* children I transmitted the fair legend of thy birth,
And *they* oft have gathered round thy shrine, as a holy place on earth.

Their children I have sporting seen, beneath thy sacred shade,
Renewing there the gambols wild, their forefathers had played;
And, with all the fond devotion of affectionate regard
My heart was still rejoicing at each season thou wast spared:
Like my Father, still surviving in the majesty of years,
While the greenness of thine age rebuked the intensiveness of fears.

Thou art fallen! thou art fallen! and we gather round thee now,
With throbbing hearts, and swimming eyes, and sorrow-clouded brow:
While we think how generation after generation here has played,
And drained so oft the cup of joy beneath thy grateful shade;
And we pledge each other, still in love, though we miss thee, sacred tree,
That through life, in death, in Heaven, united we will be.

TO A FRIEND IN AFFLICTION.

"Just and true are all Thy ways."—*Rev.* xv. 3.

Faint not in times of sorrow!
Fixed is their term and brief;
It is *not* that to-morrow
Hope promiseth relief;
Forth flowing from a Father's hand,
The tide shall ebb at His command.

While joy the bosom thrilleth,
Let watchfulness be there:
The breeze the sail that filleth,
On rocks the ship may bear;
When sailing on the exulting sea,
Still heavenward let thy glances be

The sun which fades the flower,
Bids friendly vapors rise;
And gathering storms, which lower
Upon the altered skies,
Shall fall in blessings on the earth
Whose suffering bosom gave them birth.

Thus times of darkness and of light,
Of pleasure and of grief,
Like the revolving day and night,
Which bring the earth relief,
Are ordered by a skill divine;
Then why should erring man repine?

DEW-DROPS.

Scattered on the mountain's brow
Where it lifts its front to heaven,
And the forest's giants throw
Gnarled limbs, by lightning riven;
Pearly drops, in darkness born,
Glitter in the rays of morn.

In the little, bosky dell,
Where the fountain has its source,
And the gentlest tinklings tell
The beginning of that course,
Which in never-ceasing flow
To the noblest stream shall grow;

On the verdant meadow's breast,
Where the odorous grass is spread,
And the purple violets rest,
Drooping still, with modest head;
Diamonds, pearls, or rubies here,
Morning's dew-drops, glitter clear.

Where the golden harvest waves
On the ever varying slope:
Where its heavy headed sheaves
Satisfy the farmer's hope:
Still the dew-drops have their birth,
Nightly on the teeming earth.

Mountain, valley, desert, field,
Spring-time's hopes and autumn's store,
Where their spices tropics yield,
And where northern cataracts roar;
Everywhere, the earth displays
Dew-drops to the morning rays.

Have the angel legions, hovering
In their nightly watch and ward,
Tears of pity shed, discovering
Sins no mortal eyes regard?
More would spangle waysides, then,
Than the untrodden, peaceful glen.

He who scatters fruits and flowers
With a Father's bounteous hand;
Who, dispensing genial showers,
Loosens winter's icy band:
Morning's glittering dew-drops shed
Wide as nature's bosom spreads.

Blushing, on their earthly bed
Lie they, tokens of His love;
Emblems of the influence shed,
By the spirit from above;
May that spirit's love and peace
Ever in our souls increase.

BIOGRAPHICAL SKETCH

OF

NATHANIEL ARCHER RANDOLPH, M.D.

By

HORACE JAYNE, M.D.

[Read April 4, 1888.]

Dr. Nathaniel Archer Randolph, son of Nathaniel Randolph and Eliza Sproat Randolph, was born in Philadelphia on September 7, 1858. His father, who died on September 4, 1858, was the son of Edward Randolph, Jr., and a nephew of Jacob Randolph, Professor of Clinical Surgery in the University of Pennsylvania. Dr. Randolph's childhood was marked by cheery serenity and good temper, with an unusual sense of justice and love of truth. These traits, which became so conspicuous in his character in after-life, were deepened and fixed by careful home training. He received his early education in private schools in Philadelphia, but later he was sent to Swarthmore College, near Media. Even as a schoolboy his tendencies were quite pronounced. Although possessed of a good physique, and practised in boxing, fencing, and climbing, he was not greatly interested in the usual boyish sports. He had a good ear for music and a passion for drawing, but it was the wonders of the living world about him which commanded his

enthusiasm. He very early decided what profession he would choose, and we find him at Swarthmore dubbed " the doctor," and dispensing pills and potions to his classmates.

In 1874 he entered Cornell University. Here he at once showed his interest in literary work by competing for a senior prize, and although but a subfreshman, he succeeded in winning a third of it. He was even more successful, a little later, when he wrote a prize essay on " Hawthorne's place in literature." He remained at Ithaca for two years pursuing a general scientific course. After a year spent at home and in the West, upon the plains, early in 1877 he went to Europe and remained until the following spring, devoting a large part of the time to scientific studies and in acquiring the languages. He visited the Continent again in 1879, and for a third time in 1880. In October, 1879, he entered the medical department of the University of Pennsylvania, and graduated in March, 1882. His thesis on " Certain Appearances in the Red Blood-corpuscles," largely original and illustrated by photo-micrographs, evinced careful work and marked ability, and received distinguished mention. In the autumn of 1882 he was appointed Assistant Demonstrator of Physiology in the Medical Department of the University; in October, 1883, Instructor in Physiology in the Towne Scientific School, and in 1884 in the Department of Biology. In 1886 he was elected Professor of Hygiene in the Auxiliary Department of Medicine.

He was a member and actively interested in a number of societies, among which may be mentioned the College of Physicians, the American Philosophical Society, the Academy of Natural Sciences, the Philadelphia County Medical Society, the Philadelphia Neurological Society, the Franklin Institute, the American Association of Naturalists, and the American Society for Psychical Research.

Dr. Randolph was one of those men who are born to teach. Exact and painstaking in preparation, alert to novel methods of illustration, he was clear and concise in statement. His pleasant voice and affectionate manner assisted him in establishing personal relations with every man, and he gained without apparent effort the attention and goodwill of his students. As assistant demonstrator, at Professor Allen's suggestion, he inaugurated a practical course in general biology in the University, the success of which was an important factor in the establishment of the Department of Biology. To this Department he gave much time and thought, and, in addition to the regular lectures, carried through each year elementary laboratory exercises in experimental physiology.

Of his work as a teacher of hygiene we can naturally say but little. He had given but one course of lectures, and those successfully, but judging from his enthusiasm, and the broad plans which he had mapped out, his selection was in every way a happy one.

In December, 1885, Dr. Randolph became assistant editor of the *Medical News*, which he left in May, 1887, to take chief editorship of the *Medical and Surgical Reporter*. He threw all his energy into this project and worked unceasingly in its interest. As an editor his work was marked by taste and care. He was pushing and aggressive, and fearless in denouncing what he considered wrong, and yet he was never personal, and his writings were free from all rancor.

Although actively engaged in teaching from almost the hour of his graduation, and burdened with the untried work and responsibility of a large enterprise, Dr. Randolph found time for considerable original research. He was well qualified for investigation. With an inventive turn of mind, he could easily devise new instruments and processes, and he possessed a de-

cided gift in turning ordinary materials and tools to useful account. Moreover, while alive to the bearings of a new point, he had the power to work slowly and delicately. The problems which attracted his attention were principally studies of a practical nature in the physiology and hygiene of digestion. Among these the most extensive and important were a series of examinations and experiments to determine the minute structure, chemical composition, and relative food value of the different parts of the wheat grain, and, more especially, the behavior of bran in the intestinal tract. Other inquiries in this line were upon the value of starch as a food for infants, the superiority of raw to boiled milk, the use of new pancreatized food products in gastric hyperæsthesia, and the negative character of petrolatum in digestion. He also published papers showing the rapid absorption by the skin of cod-liver oil, nicotine, and salicylic acid, pointing out the poisonous effect of turpeth mineral, and the proper time, with regard to salivary and gastric digestion, in which to exhibit hydrobromic acid and potassium iodide, and advocating the use of cocaine hydrochlorate in using nitric acid as a painless escharotic. His last paper, read before the College, was a record of interesting experiments on the irradiation of motor impulses. In August last, greatly worn by a long stretch of almost unremitting work, Dr. Randolph joined his family at Longport, New Jersey, for a few days' rest. On Sunday, the 21st, while bathing in the sea, he was swept off his feet by the unusually high waves. Although an expert and fearless swimmer, he sank in a few minutes, and when taken from the water efforts to resuscitate him were unavailing, his death being, without doubt, due to heart failure.

Dr. Randolph's personal character was distinguished by purity and sincerity. When he had once given his promise he

always kept it. Even if persuaded to do something which his judgment condemned as useless or ill advised, it was faithfully carried out, no matter with what inconvenience. He was a true lover of men, and ever ready to do a kindly act. Generous almost to a fault, he was sometimes imposed upon, but it never seemed to affect his sunny good-temper. He had few, if any, enemies, and was popular with the old as well as the young. Yet there was no striving after popularity, and while on kindly terms with his students, he remained dignified and was never accosted with impertinent familiarity. His disposition was distinctly social; a member also of the University and Journalists' Clubs, he enjoyed keenly to meet men of various pursuits and to hear the latest advance in the different lines of work, for his intellectual taste was very broad. He was a lover of books and fond of music and art. All questions of education appealing to him strongly, he was particularly interested in subjects pertaining to the higher education of women; and it is proper to record in this place his earnest support of the unsuccessful attempts to render women elegible to election in the Philadelphia County Medical Society. Such is the record of this short but useful life, a life so full of promise that in its early close we can but feel that science has lost an honest worker and mankind a friend.

A complete list of Dr. Randolph's writings is as follows:

A Note on the Feces of Starch-fed Infants. N. A. Randolph. Trans. Coll. Phys. Phila., 3d series, vol vi., 1883.

An Examination of the Feces of Twenty Persons Receiving Inunctions of Cod-liver Oil. N. A. Randolph and A. E. Roussel. Phila. Med. Times, 1883.

A Study of the Distribution of Gluten within the Wheat Grain. N. A. Randolph. Proc. Acad. Nat. Sci., 1883.

On Certain Untoward Effects of the Administration of Turpeth Mineral. N. A. Randolph and A. E. Roussel. Phila. Med. News, 1884.

A Preliminary Note on a Reaction Common to Peptone and Bile-salts. N. A. Randolph. Proc. Acad. Nat. Sci., 1884.

A Note on the Behavior of Hydrobromic Acid and of Potassium Iodide in the Digestive Tract. N. A. Randolph. Read before the Phila. Neurological Society April 28, 1884.

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ANNUAL ADDRESS.

By

S. WEIR MITCHELL, M.D.,

PRESIDENT OF THE COLLEGE.

[Delivered December 7, 1887.]

My address this December can be little else than a congratulation upon the prosperity of the College, its increasing influence, and the value of its work.

The year about to end saw our Centennial Anniversary. The ceremonies with which it was celebrated have been of use in strengthening our pride and in teaching the public our aims and our history, and thus giving us at need a willing audience and forceful influence in matters of public health.

The "Centennial Memorial Volume" has grown to such a size as will require a large number of subscriptions to enable the publication committee to meet the demands made upon them. A time will come, however, when this volume will be rare and valuable, as the edition is of necessity limited. The College owes much to its honored Ex-President, Dr. Ruschenberger. As his successor, in your name, I cordially thank him for the extraordinary care and intelligent labor bestowed upon your catalogue of Fellows, dead and living, and on his "History of the College."

During the year the College has received in money, one thousand dollars from Dr. Weightman to add to the number of works, etc., relative to the eye, left to us by his son, the late Dr. Weightman. A distinguished Associate Fellow, Da Costa Alvarenga, of Lisbon, has left us about four thousand dollars

to found an annual prize to be called after his name. Means have been taken to secure this legacy, and in time it will be necessary to intrust a permanent or temporary committee with the duty of carrying out the wishes of our deceased Fellow.

The library numbers thirty-six thousand volumes, and sixteen thousand pamphlets. It has received this year, by gift and purchase, eighteen hundred and twenty-three books, but its files of journals are still incomplete, and with every year you must expect to see this noble collection becoming more essential and more costly. It has been enriched by numerous gifts in the nature of pictures, prints, valuable autograph letters, etc. Among the latter is the interesting consultation letter of Benjamin Rush in the case of the mother of Washington, the gift of our Associate Fellow Hunter McGuire, M.D., of Virginia. Dr. T. G. Morton has presented the bust of his distinguished father; Dr. Pancoast, that of the great surgeon whose name he bears; and to the Parrish family we owe the bust of Dr. Parrish; while we must thank Mr. Richard Wood for an admirable portrait of our late president and benefactor George B. Wood.

Numerous prints, etchings, etc., have been presented by Drs. Stillé, Meigs, M. Lewis, I. Norris, Edward Shippen, Samuel Lewis, and Mr. Albert Rosenthal. An excellent crayon of Dr. Leib, a founder, we owe to his descendant Mr. Charles Harrison.

The furniture of the Lewis Library, used also as a council room, has been completed by the aid of Drs. Wurtz, Morris, Longstreth, Hutchinson, and Samuel Lewis. Tables have been placed in this room and a clock in the library. The meeting hall has been carpeted, and it is the intention of certain of the Fellows to replace the desk, furniture, and chairs, by handsome mahogany furniture decorated with our seal, etc.

The museum is now finished and in order. The beautiful "Memorial Chimney Piece" is the most interesting and expensive gift yet made to the College by a layman, and we shall not readily forget this notable evidence of the interest taken in this College by Mr. George W. Childs.

During the last month we have become possessed of a copy, of the size of the original, of the great memorial picture by Rembrandt, of Tulpius surrounded by his colleagues and pupils, and known as the "Lesson in Anatomy." Competent artists, in the Hague, were satisfied with the fidelity of this interesting ornament of your walls. It is the gift of Mary Small and Mary Cadwalader Mitchell.

It is most desirable that we possess portraits of all of our ex-presidents, and I commend this to your attention.

I am at last able to say that the kindness of the Misses Rush will, this next year, put us in possession of a portrait of Benjamin Rush.

We are the owners of many movable pieces of property, not books and not museum specimens. All such are finally within the care of the Hall Committee. To enable it to keep note of these and verify their presence yearly, the Secretary has agreed in future to notify their Secretary of all such gifts so that they may catalogue them.

Never since I have known the College has it been more usefully active. I am glad to say that the decision of the Government as to sending commissions to study cholera and yellow fever owed much to the influence which, as your President, I was able to exert with the Department of State. The value of your own recent action as to cholera in New York has been gratefully recognized by the profession and the press. Nor can I mention it without expressing admiration of the courageous intelligence of the Fellows who made up that committee. Its work is not yet over and may lead to results of wide national utility. The subject of abattoirs is still in the hands of a committee which promises a speedy report.

Thirty-three papers have been read before you. Many of these were valuable and some of them very important additions to knowledge. We must all have felt that we lack time for debate. Indeed were it not for this want, arrangements would have been made for systematic discussions such as would have been attractively useful. Unless still more work is left to the Council, I do not see how to better this

matter. I suggest, however, that all obituaries, except the most important, be assigned to the president as part of his annual address; a measure which would concentrate these minor notices and save us some time. There is another reason for this change. Memoirs are too long delayed. Sometimes it is hard to find a suitable and willing biographer. In one case known to me seven Fellows declined. When thus embarrassed the President may be enabled himself to assume the duty.

There is one other point as to which I desire to say a word. You have limited your presidential term to a possible three years. No matter what change be made as to this, I should refuse to profit by it, and am therefore free to state that it is too brief. It takes some time to acquire knowledge of your affairs and to become at ease in this chair. An active-minded man can make himself usefully felt in all branches of your work, but you lose him just as he becomes really most competent. I suggest extension of the possible term to five years.

During the year we have acquired fifteen Fellows, eleven associates, and one corresponding member.

We have lost Dr. N. A. Randolph, Dr. Elliott Richardson, and Dr. Spooner.

The Congress to occur in Washington, September 19, 1888, will bring to America a number of men of the highest reputation. The College may desire in some way to honor their presence, and on this account may wish to avoid the reception which would naturally take place this spring and substitute some entertainment in the autumn.

ANNUAL ADDRESS.

By

S. WEIR MITCHELL, M.D.,

PRESIDENT OF THE COLLEGE.

[Delivered December 5, 1888.]

For the last time as your President I appear before you to-night to give an account of the College work, and again I have the pleasant task of congratulating you on the increasing usefulness of this ancient Society.

The Fellows will have received the usual reports as to the Library, Museum, Hall, and Nurse Directory. Under your new by-law I have had, as President, the opportunity of observing closely the work of your committees. It has been to my mind careful, even vigilant, and often so laborious that I have wondered how men as busy found time for its exactions.

The papers presented in the past year were fewer than in 1887, but as regards quality were such as ought to come before a body of experts. The President is, as yet, the only person who can consider it his business to organize debates on papers of such value and weight as invite to the free and critical treatment which this manner of dealing with them involves.

The Publication Committee might fitly be charged with this duty, and perhaps, also, with the power to exclude from our *Transactions*, when published, such essays as seem scarcely to express new experiences, or any form of advance in art or science, and also the immaterial parts of long debates.

In some active foreign societies the readers of papers send in

advance *résumés* or copies of their essays to members and ask them to take part in the debate thereon. To this course there can be no objection, but some more distinct means must come into use if we desire to secure from time to time those vivifying discussions which, as I think, have valuable excitative and educational usefulness.

I need scarcely remind the Fellows that as the years go by the increasing membership of the College cannot be such as fully to make up the additional funds needed to sustain the Library and for the numerous charges which arise in connection with the care of a great institution; neither do I see how, without excluding men whom it is desirable to possess as Fellows, it is possible to increase the annual assessments. Much, then, of necessity must be left to be provided for by the generosity of individual members of the profession who are fortunate enough to possess the means and the inclination to help the College. More than all else does it require a fund for publications. Its volumes should always be open to papers so large that they are refused a place in the ordinary journals, and yet so purely scientific as to make it impossible to secure for them publication in book-form.

The Library Committee will no doubt call your attention to the special claims of the Library. Of all branches of the College work that is the one in which scholarly members of the profession must feel the largest interest. The Library has received during the year a collection of autographs and documents, which I mention only to ask the members to make such additions to them from time to time as may be possible. I may add that among those already given are invaluable letters contributing novel information as to the history of the yellow fever, and the medical history of the Revolutionary War, and as to inoculation and vaccination. In close connection with this I may be permitted to say a word in regard to the archives of the College. Twice already I have called the attention of the Fellows to this matter. These papers are thrust carelessly aside in closets, and can only be handled and examined with difficulty. A suggestion will be made to you from the Council

as to the future care of these interesting relics, which contain letters from almost every physician of distinction who has existed in this country since the War of Independence. I trust that you will have no difficulty in agreeing to the resolution of the Council, which will ask for the transfer of these papers to the charge of the Committee on the Library.

I beg especially to call your attention to the subject of electric lighting in connection with the report of the Hall Committee. It is quite certain that books suffer greatly as to their bindings in consequence of the destructive products of combustion, and also on account of the dry heat of furnaces. Both of these deteriorative agencies should be done away with.

During the past year we have added to our fellowship seventeen physicians. On the other hand we have lost six Fellows and one associate. Four of these were men advanced in life, and long since absent from the active ways of our profession. Joseph Warrington was eighty-three; both Emile Gardette and Parker were eighty-four; William Ashmead was eighty-seven. Dr. Ashmead was a warm and liberal friend of the College, and was, when he died, the oldest of its Fellowship, having been elected in 1835. Dr. Joseph Warrington became a Fellow in 1839. He also had retired from the practice of his profession, and was seen no more among us. The earlier and middle parts of his life were periods of extreme usefulness. He was largely concerned in building up that valuable institution, the Nurses' Home, where for many years was to be found the only practical instruction in midwifery then attainable in Philadelphia. The lectures were carried on with an amount of practical detail and attention to minutiæ which many of us must recall as having made them admirably instructive, and at times somewhat amusing.

Dr. Aiken Given, born March 15, 1816; died January 10, 1888. He was elected to the College in January, 1848.

John Livingston Ludlow, born May 14, 1819; died June 25, 1888. He was elected to the College in January, 1849.

Milton B. Musser, born October 20, 1846; died March 2, 1888.

Peter Parker, associate; born June 18, 1804; died 1888.

This gentleman was, I believe, the earliest medical missionary to China. He founded the Ophthalmic Hospital at Canton, China, in 1835, and for a long time rendered valuable service in China, both as a missionary and as a physician. He returned to live in Washington, where he served as a Regent of the Smithsonian Institution.

I now turn to the more agreeable task of asking the College to accept the admirable copy of Sully's portrait of Dr. Rush, which, at my suggestion, has been given to the College by two of his descendants, Miss Mary and Miss Catharine Rush. The College will undoubtedly appreciate the portrait and fitly thank the givers.

About to leave this Chair, held in turn by so many physicians of distinction, I may be permitted to say a few words as to the general policy which, so far as lay in my power, I have sought to make that of the College.

We are not merely physicians meeting to hear and to discuss facts and theories. We have assumed in this great Library and Museum, and in the Directory for Nurses, distinct trusts, which we are pledged to foster and to watch with vigilance. But our largest office should be that of incessant watchfulness of all public interests in which questions of health are concerned.

Quarantine, sanitation, water supplies, sewerage, sales of poisons, abattoirs, all have in fact claimed our attentive care during my three years in this seat. I could wish that all had been as urgently pressed to results of value as have been some of the great questions which have occupied your time. Many subjects of interest to the public health will doubtless continue to need your influential interference. What you have done you know, but perhaps you do not too fully recognize how far you have failed to insist continually on other matters, such as the reorganization of the abattoir system, and on the defects of our water supply. It is still needful to watch the efforts of the opponents of scientific research, and no matter is also more in need of reform than the sale of poisons.

As a presiding officer, I may say here that the difficulty in

carrying out all of these obvious duties arises from the fact that the men best fitted to investigate and report on such questions are already much occupied, and are unwilling to burden themselves further. Owing to this, my efforts to secure competent attention to the wretched abattoir system of Philadelphia, and to the abuses connected with the sales of poisons, have entirely failed.

If, as to these and other affairs, you are to assert your right to be usefully heard as a council of health; if this body, which represents the highest medical opinion, is to have force in days of need, it must in some shape, from time to time, keep itself before the public. It must now and then receive in these halls the representative men of this growing city, and be ready to entertain the members of other learned societies; and above all, be ever aggressively ready to take part against abuses, and to speak its mind with courage.

This is the oldest medical society of America. Its Fellowship includes many men of the highest rank, and yet, but a few years ago, there were few persons in this city who knew what we were, or were aware that we possessed the treasure of a great library, and a history not without interest. At present this is no longer so, and I am glad to reflect that the years during which you have honored me have been fertile in creating for us as a body such a familiar relation to the power and intelligence of this city as will give force to your collective opinions and re-actively elevate the general level of the profession.

I cannot conclude without having called to my mind the fact that it is the last time which, as your President, I shall have the honor to address you. I have served the three years' term provided for by your by-laws. I have earnestly endeavored to foster your interests and to do all that was possible to elevate you as a body in the opinion of the public, and thereby to increase your power for usefulness.

Although I shall no longer hold the Chair as presiding officer, the change which consigns me to the rank of a simple Fellow will in nowise lessen my willingness to take part in your active work. For many years of my life the affairs of the

College have had a firm place in my regard, and their attraction for me has not been lessened through my holding of the place with which, for three years, you have honored me.

I most honestly thank you for the indulgent kindness with which, amidst the difficulties of a responsible position, I have been treated by the Fellows.

I not unwillingly resign my cares, and may be permitted to repeat that the term of possible service is too short; and that no matter how energetic, intelligent, and dutiful your President may be, there is ample opportunity in this office for useful activity, but that like all high office it is in itself an education and may be terminated too soon for your advantage.

AN ADDRESS FROM A SPECIAL COMMITTEE OF THE COLLEGE OF PHYSICIANS OF PHILADELPHIA, TO THE MEDICAL SOCIETIES OF THE UNITED STATES:

CONCERNING THE DANGERS TO WHICH THE COUNTRY IS EXPOSED BY THE INEFFECTUAL METHODS OF QUARANTINE AT ITS PORTS, AND IN REGARD TO THE NECESSITY OF NATIONAL CONTROL OF MARITIME QUARANTINE.

[Presented December 14, 1887.]

THE undersigned, a Committee appointed at the meeting of the College of Physicians, held October 5, 1887, "to consider the present danger of the importation of cholera into this country, and to secure concerted action among the medical societies of the United States in urging upon the State and National authorities the adoption of a uniform and efficient system of quarantine for all exposed ports," has the honor of submitting herewith to your Society its report of October 28, 1887, in regard to the quarantine arrangements at the ports of New York, Philadelphia, and Baltimore.

The Committee points to the condition of affairs therein described as the outcome of the system of independent municipal and State quarantine which prevails at the ports of the United States, and asks your consideration of a brief criticism of the system, and your aid in an organized effort to establish a more satisfactory order of things by placing the management of maritime quarantine in the hands of the General Government.

In this country active consideration by legislators of the dangers which threaten the general welfare by the invasion of epidemic diseases through our foreign communications has in the past been fitful in the extreme. From 1698 down to the present moment, it has been only when, goaded by the spur of imminent danger or lashed into activity by the fresh memories of disastrous visitations, the people have with a great unanimity urgently and loudly demanded it, that spasmodic efforts to protect the general health have found a reflex in the statute laws. Whilst our statesmen and law-makers have with more or less wisdom and constancy, by the enactment of National and local laws, guarded the personal liberties and material interests of the citizen, have established more or less adequate regulations for internal trade and foreign commerce, and have performed the public duty of providing a defence against a common enemy, yet thus far they have, with singular neglect, of their own motion failed to make any attempt to provide against the ever-present danger to the general welfare from the ravages of those epidemic diseases which are brought to our shores. It is, however, true that the government has in recent years attempted to prevent the importation of diseases to which cattle are subject, by the appointment of inspectors to act in harmony with the officials of such States as have established a quarantine against diseased animals. The health laws under which we at present live are, as a rule, such only as emergencies have called into existence. Though many of their provisions may have endured beyond the danger which immediately threatened, they have been framed with an eye single to the present need, and with the expectation that an alarmed public sentiment in the threatened locality would materially supplement their in-

completeness. They have seldom or never been drafted with a full recognition of the need of adequate and constant protection of the health of the general public. Imperfect and temporizing as the local health laws have been, and still are, the spirit which has inspired them has naturally felt the promptings of local interests only, and their inefficient provisions, as a matter of course, have limited their meed of protection to the local interests involved. Moreover, the commercial interests of rival ports, the partisan struggles of opposing political factions, and the heedless parsimony with which money has been doled out for the execution of such health laws as exist, have rendered their vigorous and fearless administration well nigh impossible.

We are aware that there are among distinguished sanitarians, even in this country, those who more than question the power of any quarantine regulations which could be devised, however intelligently and thoroughly enforced, to protect efficiently the general public against invasions of contagious and infectious diseases, and who are inclined to advocate the policy that the State should rather expend her energies and money in removing local conditions which favor the development of epidemics and make their spread possible. But the only country where such a policy has been pursued with some measure of success is England, after a decade of expenditure of thirty millions of dollars per annum within her compact, small territory, located as it is out of the line of movement of the hordes of infecting emigrants constantly leaving all ports of Europe, and outside of the latitudes which favor the existence of yellow fever. After the United States of America shall have intelligently spent at least an equal sum, namely, three hundred millions of dollars, in the

earnest and persistent effort to improve the hygienic surroundings of the homes of a population already nearly twice as great as that of England, and scattered over a territory thirty-four times as extensive, we may then have reached a condition with regard to public health, in which it may possibly be wise to abandon maritime quarantine and to rely mainly upon the protection secured by a perfected local hygiene alone. Meanwhile, under present circumstances, recognizing the enormous cost of radically destroying the conditions which foster the development and prevalence of epidemics by thoroughly removing the filth among which they thrive, and fully appreciating the incalculable benefit which would certainly follow such a wise expenditure of hundreds of millions of the public money, we feel convinced that, with respect to the danger which constantly threatens the public health from abroad, there are at this time only two courses between which to choose, namely: a practical abandonment of the general public to a more or less individual and fruitless struggle with the agents of contagion and infection in whatever localities the movements of immigrants may chance to convey them; or an intelligent, constant, earnest, and vigorous effort to stop and destroy them at the ports of entry. Whilst it is true that to remove the local conditions which favor the development and spread of contagious and infectious diseases is to lessen greatly their harmfulness, it is none the less undeniable that to destroy the infecting agent or contagium, or to prevent its entrance into the country, is by a single act, to prevent the implantation of the seed and to render the harvest impossible, let the soil be never so fertile. Furthermore, the cost of preparing to wage a successful combat against the entrance and spread of disease among hundreds of scattered villages,

towns, and cities is infinitely more than that which would be required to place our ports in a nearly perfect state of defence against those diseases which are now subjected to quarantine; and the loss to the public occasioned by a single widespread epidemic of cholera, yellow fever, or smallpox is far greater than would be the cost of the proper maintenance for many years of a perfect quarantine establishment at all of our ports.

The hundreds of thousands of European immigrants who annually reach our country after starting from or passing through localities which are infected with contagious disease, frequently in their persons or in their pestiferous clothing and effects carry with them, often as far as their ultimate destination, the active germs of these diseases; and the herding of these immigrants into the miserably ventilated and frightfully unsanitary quarters usually provided for the steerage passengers on steamships, the modern rapidity of ocean travel, and the great facility with which these swarms of people are soon distributed all over our country, combine to multiply the danger to the public health with which, under the laxity of our laws and the unsatisfactory administration of them, this incessant influx constantly menaces the country.

In their enormous numbers, their poverty, and their squalor, and in their frequent transportation of all sorts of infections and contagions, these immigrants can be likened only to the oriental pilgrims, in whose track pestilence has so frequently followed. It is, indeed, with the extremest rarity that smallpox or cholera has in modern times been introduced into North America by any travellers other than the immigrant class. To take the proper means to guard the ports of entry against the

infected persons and baggage of cholera immigrants would probably keep cholera from our midst; to do the same with smallpox immigrants, with the addition of compulsory vaccination and disinfection of personal effects, as an invariable condition precedent to the privilege of landing, would go far toward banishing that scourge from the land; and the importation of scarlet fever, diphtheria, and like diseases might be prevented by similar measures.

The weighty objections urged against maritime quarantine as a means of protecting the public health from the assaults of preventible diseases imported by sea, are only two: First, the alleged failure to keep out these diseases by this means; second, the alleged injury to maritime trade.

In our opinion the first objection finds a complete answer and explanation in the grossly imperfect state and the maladministration of the quarantine defences, as shown in the accompanying report; yet it may be truthfully affirmed that the quarantine at the port of New York, in its establishment and administration, is one of the best, in many respects, that will at present be found anywhere in the world. It seems to us, therefore, absurd to argue against the capabilities of a thoroughly equipped maritime quarantine, strictly administered, from the historical failures of those establishments which, with respect to plant, equipment, and direction, have been obviously deficient in the essential requirements of a modern quarantine.

The second objection is always a serious one for a people extensively engaged in maritime trade. But it is met, we think, by a due consideration, in the light of modern knowledge, of the wide and essential difference

between the requirements for the proper treatment, respectively, of the ship's cargo, and of the ship's inhabitants. It is the ship's inhabitants, with their personal effects, who almost invariably introduce the infectious germs into the country; the merchandise rarely or never conveys the contagion. Indeed, so far as cholera, smallpox, and scarlet fever are concerned, it is only cargoes of rags that may be looked upon with suspicion as possibly capable of transporting the germs of disease from Europe to America. With this possible exception it is not only unnecessary, but there is absolutely no excuse in the treatment of ships with these diseases aboard to detain the cargoes in quarantine for a prolonged period. With adequate facilities at hand, the proper disinfection of the ship need not require her detention or that of the cargo longer than twenty-four hours, an impediment to trade too insignificant to be taken into account when the paramount interests of the public health are considered.

With reference to the detention at quarantine of those of the ship's inhabitants who are well, it need be prolonged but little beyond the period of incubation of the particular disease against which the quarantine is directed. This detention the travelling and immigrant classes alone suffer, the commercial interests of the general public being undisturbed thereby. In the great majority of instances, it is among the immigrants only that actual cases of disease exist; and when we consider the advantages which the immigrant is about to receive, the necessary detention is but a small sacrifice for him to make for the benefit of the people among whom he seeks a home.

In view of the foregoing considerations, the committee would bespeak your earnest attention to the following propositions.

A. The present methods of independent quarantine provided and regulated by seaboard states or cities, are essentially defective and insufficient for the exclusion from the United States of the diseases against which quarantine is directed:

The truth embodied in this statement is abundantly established by the report of the committee in regard to the three ports it inspected. It is fully borne out in regard to the other quarantine stations between the St. Lawrence River and the Rio Grande, by the elaborate official report of Dr. John H. Rauch, Secretary of the Illinois State Board of Health, to that body in 1886.

The defects of local quarantine stations arrange themselves in two principal groups: 1. Inadequacy of establishment. 2. Faults of administration.

1. With regard to the establishment—which term is here used to include the accommodations for the temporary housing and care of immigrants and travellers not sick, adequate hospital accommodations for the sick, appliances for disinfection, and the necessary medical, nurse, police, and other attendants for the care of both of these groups of individuals—only four of the many stations upon the Atlantic and Gulf coast may lay claim to anything like adequate provision. These are Grosse Isle quarantine station on the St. Lawrence River below Quebec, the Boston quarantine station on Galop's Island, that in the New York harbor, and those in the Mississippi River below New Orleans.

Of these four, it may be said, first, that the very excellent establishment at Grosse Isle is practically useless

as a safeguard against the importation of disease, in view of the fact stated in the report of Dr. Rauch, that during the quarantine season up to October 9, 1885, only thirty-two vessels out of a total of four hundred and twenty arrivals, had stopped at this station for examination; second, that no mention is made in Dr. Rauch's description of the quarantine station at Boston of any provision for the housing and care of travellers and immigrants not sick; third, that in the last named particular, as well as in several other respects, the quarantine station at New York, hitherto regarded as fully adequate to the requirements of that great port of entry, shows serious defects. According to the official description by Dr. Joseph Holt, President of the State Board of Health of Louisiana, it would appear that the quarantine station at the mouth of the Mississippi is, in respect of establishment, fully up to the requirements of modern science. Of the intervening stations it is scarcely necessary to speak. Certainly, as regards the prevention of cholera, and to a less extent also, of yellow fever, the greater number of them constitute quarantine stations simply in name.

2. When we come to consider faults of administration, it is obvious that it is impossible to discover their nature or extent during times of quarantine inactivity—that is to say, during those fortunately more or less prolonged periods in which the absence of disease upon incoming ships narrows the duties of the quarantine officials down to the simple inspection necessary to establish that fact. We have, therefore, at present no criterion by which to judge of the efficiency of the quarantine administration at the greater number of the stations. The fact already mentioned with reference to the quarantine station at Grosse Isle, that during the quarantine season of 1885,

up to October 9th, only thirty-two vessels out of the total four hundred and twenty were examined, indicates defects in administration at that station so glaring as to require no further comment.

Faults of administration, equally serious although of a different kind, are shown by the accompanying report of the committee to have recently existed at the quarantine station in the lower bay of New York harbor, at a time when cholera actually existed in the hospital and was from day to day finding new victims among more than five hundred Italian immigrants detained at the quarantine of observation on Hoffman Island. It is only necessary to emphasize this statement by calling attention to the following facts brought to light by the investigations of the Committee: first, the absence of resident medical officers, both at the hospital on Swinburne Island and at the quarantine of detention on Hoffman Island; second, the absence of anything like an adequate sanitary police force on the latter island; third, the absence of any effort to separate the well, detained on Hoffman Island, into small groups, and of any proper daily systematic inspection, such as would enable the authorities promptly to discover and isolate new cases of cholera; fourth, the unreasonable detention for a period of nearly two months of more than five hundred immigrants not sick, under circumstances of great hardship, exposure, and deprivation—a fact which, in view of the present state of knowledge in regard to the nature and mode of transmission of the infecting principle of cholera, in itself bears overwhelming testimony to culpable maladministration. And this was the situation after cholera had continued to prevail in countries, the ports of which were in constant, direct communication with New York, for a period of four

years, and after the entire public press of the United States had persistently called attention to the ever-present danger of its reaching our shores. When the state of affairs actually existing at the New York quarantine during the presence of cholera there in the autumn of 1887 is compared with the impressions of Dr. John H. Rauch concerning the completeness of the quarantine at that port in 1885, as expressed in his own words, the difficulty of justly estimating the real efficiency of any statement by inspections made during seasons of comparative quarantine inactivity becomes apparent. Dr. Rauch thus sums up: "With reference to the exclusion of cholera and smallpox, the quarantine plant and facilities of the port of New York are unrivalled, the printed regulations judicious, and with proper vigilance the service should suffice to prevent either of these diseases from obtaining access to the country through this avenue."

B. It is impossible adequately to protect the public health of the country against the importation of epidemic diseases by independent local maritime quarantine establishments:

1. The history of epidemic diseases in this country serves to establish the truth of this proposition. Every epidemic of cholera, typhus or yellow fever, and several important epidemics of smallpox have been directly imported despite existing quarantine regulations.

2. There is always great difficulty in obtaining sufficient appropriations of public money to defray the expenses of the necessary quarantine establishments and their proper maintenance. It is only possible, during periods of threatened invasion, to procure the considerable sums of money necessary for these purposes, whilst

in the interim the money expended is greatly inadequate, though large amounts are constantly needed. When the invader is at our gates it is often impossible to plan, construct or repair, and properly equip and garrison an efficient line of defences.

3. Rival political and commercial interests are inimical to the perfect protection of the general public by independent and local quarantine.

The port of New York, through which three-fourths of the imports and immigrants enter the country, is in the following peculiar situation with respect to the relations of local health boards: By the health laws of the State and of the municipality of New York, the principal quarantine officer is a member *ex-officio* of the municipal Board of Health of the city of New York and of the State Board of Health, and he is also a member of the Quarantine Commission. Neither the State nor the municipal boards have, therefore, a voice in the direction of quarantine. Each of these three bodies consists of a very limited number of members, and each is also entirely independent of any supervision or control by the others. Not only does this anomalous independence exist in accordance with the provisions of law, but there is undoubted evidence of an indisposition of the city Board of Health to inquire in any manner into the management of quarantine at the port, not being officially under its care.

In a letter dated November 4, 1887, replying to an official communication from the Mayor of New York, making inquiries concerning the dangers to which that city was exposed by reason of the existence of cholera at the quarantine station of the port, and the means of preventing its spread to the city, the President of the municipal Board of Health, after detailing the provisions

which had been made for the prompt isolation and treatment of cases of cholera which might develop in the city, explicitly denies official knowledge of the condition of affairs at the quarantine, and further states that he would regard it as unbecoming for him to discuss it; this, notwithstanding the fact that the quarantine officer is a member of that same Board.

4. The last statement illustrates one of the more serious dangers to which the general public is exposed through local maritime quarantine organizations; namely, the possibility of bodies of immigrants with infected baggage being transferred directly from the quarantine station to distant inland communities by rapid railroad journeys, without any prolonged sojourn, or without any adequate inspection or precautions being taken by the authorities of the seaboard cities through which they pass. In point of fact this danger was realized in regard to cholera in 1873, when epidemic outbreaks of that disease occurred in Ohio, Minnesota, and Dakota, which were "caused by cholera poison packed up, in the household effects of emigrants, in Holland, Sweden, and Russia, respectively. These emigrants sailed from healthy ports, in healthy vessels and were subjected to the usual sanitary requirements of the period. They passed through New York and the intermediate territory without injury to the public health; but when their infected goods were unpacked in the interior of the continent, they liberated the poison which gave rise to the local outbreaks." [Report of Dr. Rauch.]

5. It is but natural that municipal organizations should, in looking after their own interests, pay little regard to the welfare of distant communities.

In this connection may be noted the indisposition and failure on the part of local quarantine officers to notify the authorities interested of the arrival of emigrants from infected localities. Notwithstanding the frequent paramount interest of inland communities in the efficiency of the establishment and administration of quarantine at the seaboard, the local authorities of the latter frequently evince an unreasonable jealousy of any sort of investigation or suggestion looking to the general welfare.

6. In the absence of any general regulation or supervision, local quarantine measures must, in the nature of things, be exercised with varying degrees of efficiency; the most complete establishment and perfect administration at a few ports might, therefore, fail to protect the country if defective or inadequate measures of quarantine were practised elsewhere.

C. A national system of maritime quarantine is necessary:

1. It is only by this means that the necessary protection against the importation of epidemic diseases in all our ports can be continuously secured.

2. It is the only practical means by which uniformity of establishment and administration, regard being had to the modifications made necessary by difference of latitude and other circumstances, can be assured. Such necessary uniformity can be obtained by no other arrangement, for the reason that the National Government is alone able to defray the expense of complete quarantine establishments at every port, according to the requirement of each and without regard to the revenue derived from the shipping of any.

3. The benefits of quarantine inure to the welfare of

the whole country; therefore, it is just that money should be as freely expended when necessary at one port as at another, without respect to their relative commercial importance. It is manifestly unfair that the seaboard cities and States should, as at present, be obliged to bear the entire expense of quarantine establishments designed to protect the inhabitants of every region of the vast territory of the United States.

4. A national quarantine, properly administered and conducted by trained officials accustomed to deal with contagious and infectious diseases, would tend to prevent panic, to allay undue anxiety, and to favor a reasonable sense of security.

5. Experience has shown that much needless alarm, as well as preventable danger, arises upon the appearance of an unfamiliar epidemic disease at quarantine stations; as when cholera has shown itself at New Orleans or New York, or yellow fever at Philadelphia or Boston. A national quarantine would go far to do away with the necessity for vexatious temporary interstate quarantines which so seriously disturb inland trade.

6. A national quarantine system, directed in such a manner as fully to meet the requirements of existing sanitary knowledge, would not adversely disturb any commercial interest. It would, on the contrary, do away with many of the embarrassments incident to maladministration of existing local regulations. For example, the healthy passengers of the Italian steamship "Alesia" were detained at quarantine in New York harbor for a period of fifty-eight days, while under an efficient system uninfluenced by needless fears, those of them who were free from disease could have been safely liberated in ten days at furthest.

7. A national quarantine would not necessarily supersede any existing arrangements regarded as expedient by local authorities. It should be conducted wholly without cost to shipping, and would thus work no additional pecuniary hardship, even if the present fees were to be still exacted by the local authorities.

8. The ability of the National Government, by an existing act of Congress, to come to the aid of local quarantine authorities in answer to the appeal of the Executive of any State in time of grave danger, implies a function of very narrow scope and uncertain application. Appeals of this kind are apt to be deferred until the emergency is extreme, and the aid obtained from the Government is, therefore, likely to be rendered too late to accomplish its most important purpose, namely, the prevention of an invasion.

D. A national organization would secure advantages not attainable by independent local quarantine establishments however complete:

1. Suitably arranged and commodious buildings, provided with necessary furniture and appliances at all ports.

2. An efficient corps of trained officials and assistants always on duty.

3. The practicability of the concentration of force, money and attention at any threatened port without loss of time.

4. Officials under control of the National Government, and free from local political and commercial influences.

5. The objects of quarantine would be furthered by full and reliable consular reports and sanitary inspection of emigrants at ports of embarkation, functions properly belonging to officials of the General Government.

The organization of a national maritime quarantine system in the United States should require:

1. That the whole matter be placed under an appropriate department of the General Government.

2. A central bureau of control established at Washington.

3. A sufficient corps of medical officers and assistants, with nurses, sanitary police, laundrymen, engineers, and officers and crews for boarding tugs, organized at every station. Among the requirements for the medical service should be a speaking knowledge of at least two modern languages besides English. The establishment of a school and laboratories for sanitary instruction and research in connection with this service would be an advantage. In addition to the men on duty at the respective stations, there should be a sufficient number of medical and other officials fully trained in quarantine duties and familiar with contagious diseases, unattached and available for immediate auxiliary service at any threatened port.

4. The erection of necessary hospital, and other buildings, wharves, disinfecting apparatus, wash-houses, latrines, etc., in suitable localities, when possible upon islands at or near the entrances to harbors, and at some distance from the main channel.

5. These stations must be organized and fully equipped at every port of entry of the coast, in such a way as to meet the requirements of each port in the measure of its commerce and immigration, and the especial diseases to which it is most exposed.

6. The cost of the establishment and maintenance of the national maritime quarantine should be provided for

by appropriation from the national treasury, and not from fees exacted from vessels.

Summary.—Under the present system of local and independent maritime quarantine, the necessary quarters for the detention of large numbers of immigrants arriving in a suspected vessel, are either entirely wanting, or, if at hand, are deficient in equipment or administration or both. It is possible, however, that one port well governed and rich from prosperous commerce, may make up these deficiencies; yet what would this avail even to that community itself, if a neighboring port, only a few hours distant by rail, failed to exclude epidemic diseases. The front door might be doubly barred and bolted, but the enemy would find an easy passage through the defenceless rear. As recent examples thereof may be instanced the danger of an epidemic of yellow fever to which the little town of Biloxi, in Mississippi, exposed in 1886 not only the interior States but even the city of New Orleans itself, now apparently so well protected by her own system of maritime quarantine; and that to which, in 1887, the defenceless condition of the small port of Tampa, in Florida, exposed not only that State but others.

This want of uniformity in the quarantine defences along our coast must necessarily exist when different authorities supply the money for maintaining the several stations and the purse of one port is longer than that of its neighbor. Another money difficulty is found when the appropriation for the same station comes, as it may, from the coffers of both city and State; possible difference of opinion in the municipal council and the State legislature is likely to endanger the sufficiency or change the

direction of the funds to be expended. In any case, the danger to a single port of entry, or even to a single State, is by no means the same as that which threatens the country at large, and communities are not likely to make a larger expenditure than is needed for their own defence. As an illustration of a difference in the conditions of danger which may exist between a port of entry and the interior of the country, may be mentioned the passage of immigrants with infected baggage. The immigrants may come from a healthy port and in a healthy ship, and with the poison securely imprisoned in their baggage, will pass through the port of entry with perfect safety to its inhabitants; the danger will begin in that far interior where the baggage is opened. It is of no interest to that port to have the baggage disinfected, and it is carried on to some uncertain place unhindered to do its fatal work. And here may be pointed out the rather peculiar position in which America finds itself, in attracting to its shores hordes of immigrants from the older countries. There is in municipalities little disposition to spend more even than is called for to satisfy immediate wants; remote necessities are seldom provided for. A quarantine that is not always in use, is not always ready for use. It is only when danger is at its gates, and when, perhaps, it is too late for protection, that a city wakes up to its defenceless state. Municipalities are selfish, and knowing that with the trader quarantine is not a favorite institution, and that it is his tendency to sail into that port where the quarantine is most lax, they are assailed with a sore temptation to wink at the neglect of proper precautions, if, by so doing, they may circumvent a possible commercial rival.

In the opinion of the Committee, the difficulties men-

tioned can only be overcome by the adoption of a maritime quarantine under the control of the National Government.

The danger from immigrants would not be entirely banished, however, though the quarantine of the coast of the United States were perfect; for the way through the British provinces would still be open to these travellers. In the absence of efficient quarantine inspection in the St. Lawrence River, the attempt thoroughly to protect ourselves from importations of epidemics, would necessitate the doubtful and difficult expedient of a land quarantine. The more efficient plan would be to have the same precautions taken at the ports in the British provinces as should be practised at those in the United States, but this course could only be assured through treaty, which our local authorities are not competent to make.

It appears that our Canadian neighbors have already evinced their desire for uniform quarantine laws for the two governments. The Provincial Board of Health of Montreal, recognizing a community of interest in the question of maritime quarantine, have deemed the presence of the Canadian Fish Commissioners in Washington opportune for the adoption of resolutions requesting them to urge upon the American authorities "the necessity of establishing uniform quarantine regulations for both countries." In connection with an efficient system of national quarantine, a harmony in the provisions of law in the United States and in Canada seems indispensable for the full protection of our extensive northern frontier, and our National Government should be strongly urged to respond actively to the expressed wishes of the Canadian authorities relating to such an important matter of common interest.

In conclusion, the College of Physicians of Philadelphia, through its Committee, earnestly asks your prompt consideration of the matters herein set forth, and your active coöperation in an organized effort to obtain this winter such national legislation as will efficiently and with reasonable security protect the public health, not only from the danger of the importation of cholera and yellow fever during the time that they are epidemic in countries with which the ports of the United States are in communication, but also from the almost incessant conveyance into the interior of the contagion of scarlet fever and smallpox by emigrants. The disappearance of cholera from the quarantine station at New York, without the development of the disease anywhere in the country, should be regarded as a fortunate occurrence, but at the same time a serious warning. This country has never yet escaped an epidemic of cholera when it has visited Europe. Sooner or later, the disease has invariably been introduced and has spread more or less widely throughout our land. We should, therefore, profit by the cold season, during which we are comparatively safe from the ravages of two of the most dreaded of our imported epidemic diseases, to prepare against a possible, and, as many believe, even a very probable, advent of cholera with the return of warm weather. We should use the present opportunity to arouse public sentiment and our national legislators to the necessity of wise, deliberate, far-reaching, and prompt action in behalf of the general welfare, by the establishment all along our coast of a thoroughly equipped and efficiently directed maritime quarantine.

In the case that your Society determine to coöperate in securing the ends in view, we would respectfully sug-

gest that you at once notify the committee of the fact, and, without delay, authorize a member of your body (whose name and post-office address should accompany the notification) to confer with the Committee either by correspondence or in person, for the purpose of deciding upon the details of a bill to be introduced in Congress early in the present session.

If your coöperation be agreed upon, we would further suggest that, as a body and as individuals, you assist in influencing legislation by the following means:

1. The passage of formal resolutions recognizing the necessity of National control of maritime quarantine, and urgently recommending the matter upon the consideration of your representatives in Congress.

2. Strenuous efforts to enlist popular sentiment in support of such legislation.

3. The enlistment of the influence of the local medical and public press.

Finally, in view of the necessity of inaugurating, at the earliest moment possible, the effort to secure the proposed legislation, we would earnestly request prompt action on the part of your Society and early notification thereof.

J. C. Wilson, *Chairman.*
E. O. Shakespeare,
R. A. Cleemann.

REPORT OF THE COMMITTEE OF THE COLLEGE OF PHYSICIANS OF PHILADELPHIA

APPOINTED TO INVESTIGATE THE EFFICIENCY OF OUR QUARANTINE ARRANGEMENTS FOR THE EXCLUSION OF CHOLERA AND OTHER EPIDEMIC DISEASES.

[Presented October 28, 1887.]

To the President and Fellows of the College:

Your Committee appointed at the meeting of the College held October 5, 1887, to consider the present danger of the importation of cholera into this country, and to secure concerted action among the medical societies of the land in urging upon the State and National authorities the adoption of a uniform and efficient system of quarantine for all exposed ports, respectfully reports as follows:

The acceptance of the germ theory of infectious and contagious diseases, or the probability at least of its truth, places in a new light the management of quarantine for detention and disinfection of vessels and their passengers. Anterior to the promulgation of this doctrine the etiology of these diseases was so obscure, that it is not a matter of surprise that such diverse views existed on the subject of quarantine; as shown by its absolute abandonment in Great Britain, for instance, and, on the other hand, by its enforcement with unreasonable severity in the southern ports of Europe. There was no clear idea of that which was to be guarded against, and, therefore, no measures

generally and unreservedly accepted as a means to the desired end.

In view of the nature of the work with which your Committee was charged, we found ourselves confronted with two questions of urgent importance:

I. What are the requirements of an efficient maritime quarantine against cholera?

II. To what extent do the existing arrangements at the ports of New York, Philadelphia, and Baltimore fulfil these requirements? [We speak of these ports only, because circumstances did not permit more extended personal investigations, and there is no reason to believe, from the published official descriptions, that the conditions of the other ports of entry upon our Atlantic and Gulf coasts are in any respect superior.]

I. In reply to the first of these questions, we cannot do better than quote at length from the editorial pages of a recent number of *The Medical News*.[1]

"Measures of prevention, to give the greatest possible guarantee of success in extinguishing an incipient epidemic of cholera, should, in the first place, be based upon the most exact knowledge we possess of the cause, mode of attack, and manner of spread of the disease; and, in the second place, these measures should be intelligently, thoroughly, and rigidly enforced.

"What are the considerations involved in the first category? Probably nine-tenths of intelligent and experienced physicians all over the world, even including those of India, have for years admitted that there is most convincing proof that the active cause of the disease is a specific, material, living entity, of extremely minute size, endowed with the power of self-propagation, and of exceedingly rapid multiplication in enormous numbers; that among animals it naturally attacks

[1] October 15, 1887, pages 455, 456, 457.

man alone, assailing him only by way of the intestinal canal; that the evacuations from the bowels contain the active cause of the disease, and that when this agent in any manner—as through drinking water, milk, food, or the handling or washing of contaminated personal effects, etc.—reaches the intestines of another susceptible person, the disease may be thereby transmitted from the sick to the healthy; that the active agent exists in the dejecta of the lightest and most imperceptible no less than the severest and most deadly forms of the disease, and is known to be transportable from place to place through the movements of man and his personal effects.

"Proceeding from this basis, logical deduction and common experience alike demonstrate the absolute necessity and efficiency of such measures of prevention as the following:

"*a.* Speedy recognition and isolation of the sick; their proper treatment; absolute and rapid destruction of the infectious agent of the disease, not only in the dejecta and vomit, but also in clothing, bedding, and in or upon whatever else it finds a resting-place.

"*b.* The convalescents should remain isolated from the healthy so long as their stools possibly contain any of the infecting agent; before mingling again with the well they should be immersed in a disinfecting bath, and afterward be clothed from the skin outward with perfectly clean vestments, which cannot possibly contain any of the infectious material.

"*c.* The dead should be well wrapped in cloth thoroughly saturated in a solution of corrosive sublimate, 1 to 500, and without delay, cortege, or lengthy ceremonial, buried near the place of death in a deep grave, remote as possible from water which may, under any circumstances, be used for drinking, washing, culinary, or other domestic purposes. (Cremation, of course, is by far the safest way of disposing of cholera cadavers.)

"*d.* Those handling the sick or the dead should be careful to disinfect their hands and soiled clothing at once, and especially before touching articles of food, drinking or culinary vessels.

"*e.* In the case of maritime quarantine, the well should be disembarked and placed under observation in quarters spacious enough to avoid crowding, and so well appointed and furnished that none will suffer real hardships.

"*f*. Once having reached the station, those under observation should be separated in groups of not more than twelve to twenty-four, and the various groups should, under no pretext, intermingle; the quarters for each group should afford stationary lavatories and water-closets in perfect working condition, adequate to the needs of the individuals constituting the group, and supplied with proper means of disinfection; there should be a bed raised above the floor, proper coverings, and a chair for each member of the group, each person being required to use only his own bed; there should be a common table of sufficient size to seat around it all the members of the group, who should be served their meals from a central kitchen, and with table furniture belonging to the station and cleaned by the common kitchen scullions.

"*g*. Drinking-water, free from possible contamination and of the best quality, should be distributed in the quarters of each group, as it is needed, and in such a manner that it is received in drinking-cups only; there should be no water-buckets or other large vessels in which handkerchiefs, small vestments, children's diapers, etc., can be washed by the members of any group.

"*h*. Immediately after being separated into groups in their respective quarters, every person under observation should be obliged to strip and get into a bath (a disinfecting one is preferable), and afterward be clothed with fresh, clean vestments from the skin outward. Every article of clothing previously worn should be taken away and properly disinfected.

"*i*. Then all of the personal effects should be at once removed to a separate building, washed—if possible—and thoroughly disinfected, or, if necessary, destroyed. After disinfection they should be temporarily returned to the members of groups, when occasion requires a further change of clothing.

"*k*. Under no circumstances whatever should washing of clothing by those under observation be permitted. All used clothing should be first thoroughly disinfected (by boiling, when possible), and then should be cleansed, the disinfection and washing being done by a sufficiently trained and absolutely reliable corps of employés supplied with adequate appliances.

"*l*. All of those under observation should be mustered in their

own quarters and be subjected to a close medical inspection, *while on their feet*, at least twice every day, in order to discover and isolate as soon as possible new cases which may develop; and, of course, the clothing and bedding of these new cases should be treated without delay in the manner already mentioned. In the mean time a watch should be set over the water-closets, for the purpose of discovering cases of diarrhœa, and, when discovered, such cases should be temporarily separated from the rest; they should receive judicious medical attention at once, and precautions should be taken as if they were undoubted, but mild, cases of cholera.

"*m*. The quarters should be kept thoroughly clean, and every surface upon which infectious material could possibly be deposited, including the floors, should be washed with a strong disinfectant twice daily, and oftener when necessary; evacuations from the bowels should be passed into a strong disinfectant; the hopper of the closet should be then flushed, and finally drenched with a quantity of the same disinfectant.

"*n*. For the proper attention to the sick, there should be two or more competent and experienced physicians, assisted by a sufficient corps of intelligent and efficient nurses, with hours of duty so arranged that a physician with a sufficient number of nurses be in constant attendance in the wards of the hospital.

"*o*. For the prompt recognition and separation of new cases, their temporary medical attention, the proper treatment of discovered cases of diarrhœa or cholerine, and of other maladies, and the immediate correction of every insanitary practice or condition by constant, vigilant, and intelligent supervision, there should be at least two or more competent and experienced physicians, with hours of service so arranged that a physician is on duty night and day among those under observation; and he should have subject to his orders, at any and every moment, a sufficient and efficient corps of nurses and laborers to carry out properly and promptly his directions.

"*p*. In order to prevent the intermingling of the various groups, to enforce obedience and order, and to make it absolutely impossible for the quarantined and their personal effects to have any communication with the exterior, a well organized and sufficiently large police

corps should patrol the borders of the stations and the buildings day and night.

"*q*. Any group among whom there has developed no new cases of cholera, or of choleraic diarrhœa, during the preceding eight or ten days, may be regarded as harmless, and allowed to leave quarantine after each one is finally immersed in a disinfecting bath, and reclothed with clean garments from the skin outward; the garments removed being destroyed, or thoroughly disinfected and cleansed as above indicated.

"As yet, no reference has been made to the crew, ship, and cargo. What has been said of the treatment of those under observation, applies to every one of the ship's inhabitants. The observation, isolation, and cleansing of the crew and their effects, could safely be performed aboard ship if necessary. The ship should be thoroughly cleansed and disinfected, particular attention being given to the quarters of the emigrants and crew."

II. The second question is, To what extent do the existing arrangements at the ports of New York, Philadelphia, and Baltimore fulfil these requirements?

Your Committee began its work by personally inspecting the quarantine stations at New York, Philadelphia, and Baltimore, arrangements having been previously made with the respective officials.

QUARANTINE STATION AT NEW YORK.

The quarantine establishment, visited October 8th, consists of a boarding station, which is the residence of the Health Officer, situated on Staten Island, four miles below the city, just within the Narrows at the entrance of the harbor, and in connection with New York city by telegraph and telephone; of an island of observation known as Hoffman Island, and of another, Swinburne Island, on which latter is erected a large hospital building.

These islands are artificial, being made of foundations of rock, covered with sand; are situated in the lower bay about five miles below the boarding station, and two miles from the shore.

Hoffman Island is probably four acres in area, and rises some eight feet above the level of the sea. There are upon it two large brick buildings of two stories each, and a smaller building, the latter provided with cooking and heating apparatus for the larger buildings. One of the large buildings is furnished with water-closets in each story, and a lavatory in the upper. The rooms of this building are without furniture or bedsteads.

The water supply of this island is as follows: There is a cistern lined with brick, sunken beneath the surface of the sand near each of the large buildings, to collect rain-water from the roof, but at the time of our visit the sunken cisterns contained Croton water brought from the city of New York. The openings of these cisterns are provided with caps. In addition to these, there are two iron tanks of considerable dimensions in the large buildings in which the water-closets are located, and they are elevated some distance above the head. One of these tanks is intended for fresh water, to be used for bathing; the other for salt water to be used exclusively for flushing the water-closets. We found that owing to imperfection in the apparatus, several of the water-closets could not be flushed. The iron soil pipes into which these closets empty lead into the sea, each pipe having, as we were informed, a number of right angles in its course. In the corner of one of the rooms containing the water-closets there was a barrel nearly full of a solution of corrosive sublimate, one part to five hundred. This was employed for the purpose of drenching the pans of the closets *after*

they had been used and flushed. We found the seats and the floors of these water-closets extremely wet.

The lavatory was a small room opposite the water-closets of the second story, containing two metallic bath-tubs, and a few stationary washstands, supplied with fresh water from the above-mentioned tank. We were informed that the bath-tubs had not been used during the present emergency. Immediately opposite the water-closets on the lower floor, and beneath the lavatory, was a small room devoted to the uses of a temporary hospital. This room contained four bedsteads with the corresponding bedding, but no other furniture, and was occupied by three recently developed cases of cholera.

In the other large building there were constructed in corners on the first floor two disinfecting rooms, fifteen feet by twenty, each having one or more windows communicating with the external air. These rooms appeared to be otherwise air-tight. The remainder of the first floor constituted a large wareroom for the storage of baggage. The disinfecting apparatus was supplemented by a large wooden vat, located in the boiler-house, for the purpose of subjecting clothing to the action of steam, but it was not placed in position until after the first week of detention.

This island was occupied by upward of five hundred men, women, and children, passengers from the cholera-infected steamship "Alesia," who at that date had been upon the island sixteen days. They roamed at will over the island and through the rooms of the large buildings, except the one in the second story of the building in which the disinfection had taken place, which was occupied by a number of people of the better class, who seemed to have exclusive use of it.

These two buildings were supplied with a limited number of mattresses and blankets, which were collected together in piles. We learned that this bedding had been supplied by the steamship company, but that none of it arrived until five days subsequent to the debarkation of the passengers upon the island. The immigrants were permitted access to a portion of their personal effects after disinfection. Many of the people were engaged in washing their clothing. This washing was done in vessels of various kinds and in the immediate vicinity of the mouths of the sunken cisterns. At the time of our visit the latter were uncovered, and the ground around them was saturated with the water which had been used in washing, and a number of people were scouring with this wet sand, the pans and tins in which they received their food and drinking water. They drew the water from the cisterns by pails and vessels of various kinds. According to information received, these cisterns had not been cleaned out in a number of years.

By reason of want of facilities for perfect flushing of the water-closets, due to a defect in the pumps, a supplementary latrine had been extemporized by digging a long deep trench in the sand not more than fifty feet distant from one of the large buildings, and about thirty feet from one of the cisterns. Notwithstanding these arrangements, it was impossible, on account of the inadequate police, to prevent the people from defecating in any convenient spot, and although they had been enjoined by the Health Officer against the use of the water in the sunken cisterns for drinking purposes, there were no means of enforcing this order, for access to the cisterns could indeed be had at all times. Drinking water brought from New York City was distributed upon application at a tank in

one of the buildings. Food supplied by the agents of the steamship company, and, as we were informed, brought to the island in their vessels, was prepared in the kitchen and distributed in sufficient quantities. This food, which was well cooked, consisted of bread, soup, macaroni, potatoes, pork, and beans. The dishes were generally used in common by families or small groups, and the absence of knives and forks was noteworthy.

The police force of the island consisted of one watchman assisted by an improvised corps of twelve of the more intelligent of the immigrants, each of whom received for his services one dollar per diem. In addition to the police force, there were three or four men in the employ of the Health Officer, whose duties were attention to the disinfection of baggage, to the water-closets, to the cleanliness of the buildings, to the detection of new cases of cholera and their removal to the temporary hospital, and to other similar matters. Besides these there were a cook furnished by the agents of the steamship company, and an engineer.

There was no resident medical officer upon the island. The Health Officer, who is a physician, visited the island once, and sometimes twice daily, for the purpose of inspecting the immigrants, and for the general conduct and direction of affairs. At these times the new cases which had developed in the intervals of his visits, were transferred to the hospital on Swinburne Island.

At the time of the arrival of the "Alesia," there were on board eight cases of cholera, all of which were at once transferred to the hospital on Swinburne Island. The rest of the steerage passengers, apparently free from the disease, were, with their baggage, landed on Hoffman Island, the cabin passengers and crew remaining on board

the vessel. The clothing of the cholera patients was taken back from the hospital on Swinburne Island to Hoffman Island to be disinfected, and the same course was afterward pursued with the clothing of those who, having been taken ill with the cholera, were from time to time removed to Swinburne Island. Up to the time of our visit, sixteen days after the arrival of the ship, twenty-seven new cases of cholera had developed, of which three were discovered on the day of our visit. Of the eight sick at the time of the removal of the passengers from the steamer, five died, and of the twenty-seven cases attacked upon the island, nine proved fatal, making a total mortality of fourteen. As soon as the immigrants were landed from the ship, their baggage was taken from them and stored on the lower floor of the large building in which disinfection was carried out. The process of disinfection was as follows: The articles were separated, shaken out and hung up in the disinfecting rooms, three pounds of sulphur being burned for every 1000 cubic feet of space. The disinfection of the baggage for the first time occupied five or six days, during which period the immigrants were denied access to their effects and continued to wear the clothing which they had on when they left the ship. The steam disinfecting apparatus before referred to, was not placed in position until toward the end of the first week. After that the baggage was for a second time disinfected, a double process being employed: the clothing being first subjected to the action of steam and then to the fumes of sulphur. After the first disinfection, those whose clothing was accessible, were permitted to change their garments, and were thereafter assigned to sleep in a separate room, but were not prevented from mingling with the other immigrants

during the day. No effort was made otherwise to separate the passengers into isolated groups, nor indeed was there, in our opinion, any adequate provisions to prevent occasional communications by means of small boats, especially at night, between Hoffman Island and the shore. We were informed that boats had not infrequently been seen hovering around the island, and had occasionally been warned off.

Swinburne Island, on which the hospital is located, is somewhat larger than Hoffman Island. The hospital, consisting of several one-story wooden pavilions, and the grounds are in excellent condition. The water supply is contained in sunken cisterns for the storage of rain water, placed in the open spaces between the pavilions. The mouths of these cisterns are on a level with the ground, and are covered with stone slabs. There is an adequate heating and cooking apparatus, and there are also a small disinfecting room and an apothecary shop.

The *personnel* of this island consists of a resident superintendent, who is not a physician, and, at the time of our visit, two male nurses, one of whom at different times had attended medical lectures. There was also an intelligent Italian gentleman, without medical or nurse training, who had volunteered his services in the care of the sick. The wards of the hospital were supplied with a sufficient number of bedsteads and necessary bedding in good condition, and contained nine patients, including the three discovered on the day of our visit, and who had been brought over with us from Hoffman Island.

The dead were buried in shallow graves on a sandspit at the extreme end of Staten Island, known as Seguin's Point.

QUARANTINE STATION AT PHILADELPHIA.

We visited this station, known as the Lazaretto, October 13th, and made the following observations: It is situated on the right bank of the Delaware River, eleven miles from the city, on Little Tinicum Island, a large tract devoted to farming, which is separated from the mainland by Darby Creek. It comprises twelve acres belonging to the city and six acres the property of the United States Government. There is a large main building of brick, substantially constructed at the beginning of this century. The central portion of this building is occupied by the steward, and contains offices of administration. There are two wings, two stories and an attic in height, one of which is used by the crew of the boarding steam-vessel, and the other is arranged for hospital purposes, with a capacity of forty beds; but it is at present unfurnished.

Some distance in the rear of this building is a two-story brick hospital, with a capacity of thirty beds, and containing a dispensary. The dead-house is at the end of the building, but does not communicate with it. Near by is a wooden building ten feet by twelve feet, with a double wall and without windows, used for disinfecting by sulphur. There are at the station thirty-eight bedsteads, mattresses, and corresponding furnishing. Two small brick buildings near the river front accommodate the Lazaretto Physician and Quarantine Master, respectively.

The water-supply is obtained from old-fashioned wells with hand pumps. There are no large reservoirs for water, or large steam-boilers, or bath-tubs. There are several privies, but no water-closets. The station is

connected with the city by telegraph. The Lazaretto Physician, the Quarantine Master, the male nurse, the telegraph operator, the crew of the boarding vessel, and the other attendants reside at the station during the quarantine season, which, as a rule, lasts from the first of June until the first of October. The steward resides at the station during the whole year. When the quarantine station is closed, the port-physician examines the vessels in the stream opposite the city.

On the government property is a large stone warehouse, about 120 feet by 40 feet, two stories and an attic in height, and also two brick buildings, in one of which resides the government inspector. There are no means of heating this warehouse, and its numerous windows are without sashes.

QUARANTINE STATION AT BALTIMORE.

This station, which is a new one, having been occupied only two years, is situated seven miles below Baltimore on the right bank of the Patapsco River, upon a point of the mainland jutting out into the stream and known as Little Hawkin's Point. The territory embraced in the quarantine station consists of fifteen acres, upon which are erected three frame dwellings, namely, a hospital of two stories with accommodations for about sixty patients, a dwelling for the medical officers, and another for the use of the crew of the boarding tug. The water is supplied by a spring about two hundred yards distant, being lifted by a windmill to a tank sufficiently high to permit of its distribution to the second story of the buildings.

The station has in store seventy-five tents to be used

in emergency. No fence or wall separates the grounds from the adjacent land. At the time of our visit the hospital was unoccupied and locked up, so that we were unable to inspect the interior, but were informed that it was supplied with iron bedsteads and the necessary bedding. There is no special disinfecting apparatus at the station, nor any adequate means of disinfection; but there was pointed out to us a wing of the hospital designed for a kitchen, consisting of a small room with two windows and a door communicating with the building, in which, it was said, fumigation with sulphur could be practised. The water in front of the station is shoal, large vessels being obliged to anchor within two hundred yards of the main channel. The Quarantine Officer and his assistant, both of whom are physicians, besides the crew of the tug, a male nurse, and a gardener, reside at the station during the quarantine season, which usually ends October 31st.

We also visited the place four miles nearer Baltimore, which was formerly used as the quarantine station. It is now unoccupied and fallen into decay. It consists of a tract of land about four hundred acres in extent and several dilapidated buildings, including eight one-story wooden barracks. This establishment is occasionally used as a pest-house for smallpox cases from the city of Baltimore. It is now unfurnished and untenantable.

CONCLUSIONS.

It is evident that the quarantine establishments at Philadelphia and at Baltimore fail in the most essential requisites of the necessary number of properly equipped

buildings for the isolation and observation of a large number of immigrants.

In regard to the station at New York, the buildings are sufficiently large and numerous, and have adequate arrangements for heating and cooking, but they are not divided into a sufficient number of small compartments to permit the strict isolation of the immigrants into small groups. The water-closets were not sufficiently numerous, nor were they all in good working order; neither were there enough bath-tubs. The pumps, by which the supply of sea water used for flushing these closets was obtained, were out of order, and a period of two weeks elapsed before the necessary repairs could be made. It is also worthy of note that the soil-pipes only reached the sea by the already mentioned series of angular turns.

The necessary use of the supplementary latrine we have described. Objectionable in construction and situation, as it was, it constituted a menace to the safety of the immigrants detained upon the island, among whom new cases were from day to day occurring. The dangers of infection were still further increased by the fact that the immigrants could not, under the existing state of affairs, be prevented from defecating at any convenient spot.

There was no provision for the general washing of clothing by the authorities. As a result of this defect, there arose the exceedingly dangerous practice of the washing of clothes at the cisterns by the immigrants themselves. The existence of underground cisterns at a station of this kind is, in itself, highly objectionable. All water reservoirs should be inaccessible to the immigrants, and should be placed above ground in such a manner as to avoid all danger of accidental contamination.

The disinfecting chambers were sufficiently capacious, but the existence of windows in them was a fault of construction which would seem decidedly to impair their efficiency.

The lack of bedsteads, chairs, tables, and proper eating utensils, added to the hardships of the immigrants and to the dangers of infection.

The location of the room used as a temporary hospital, namely, directly opposite one of the water-closets, and the fact that patients, known to have cholera and placed in this hospital, were allowed to use the water-closets in common with others, constituted a serious danger, and suggested the advisability of the use, for this purpose, of a separate building provided with its own water-closets and system of drainage.

Your Committee feels called upon to comment upon the absence of a resident medical officer at this station, and of an adequate force of watchmen, patrolmen, and attendants. As a consequence of these defects of organization, the well-recognized requirements of a quarantine of observation as pointed out in paragraphs *o*, *p*, and *q* above, could not possibly be fulfilled. The possibility of occasional clandestine communication between the detained immigrants and their friends ashore, by means of small boats, constituted a danger to the country, difficult to estimate, and against which, so far as we could learn, there were no certain precautions.

There was, in fact, no official supervision of the personal hygiene of the detained, no compulsory bathing or washing. The absence of towels in the lavatory and of paper in the water-closets, was notable. Soiled hands and filthy clothing indicated habits which favored the transmission of the cholera infection from person to

person, particularly as the custom of several individuals eating from a common dish, without knives or forks, was frequently observed.

One of the results of the absence of bedsteads was the promiscuous heaping together of the mattresses and blankets during the day, in order to make room for washing the floors with disinfectant solutions; the bedding was thus doubtless used on successive nights by different persons, constituting a very probable means of transmission of the disease if it should become soiled by dejecta or vomit. Furthermore, as there was an insufficient number of mattresses, two or more persons must have, in many instances, occupied one bed.

The hospital building on Swinburne Island appeared to be excellently adapted to its purposes. The use of underground cisterns for the storage of water is, however, here also objectionable. As there were no less than nine cases of cholera in the wards, at the time of our visit, some of whom were desperately ill, your Committee noted with surprise the absence of a resident physician, a fact that demands no further comment. And it was a reversal of modern ideas to find male nurses in charge of female patients.

Your Committee was at a loss to understand why the clothing of patients was sent back to Hoffman Island to be disinfected, as there is a disinfecting chamber in connection with the hospital. We were informed that the convalescents were, as soon as they were strong enough to be about, returned to Hoffman Island, without having been previously bathed and disinfected.

The recent arrival of the "Britannia," another steamship of the same line, with a large number of Italian immigrants from the infected port of Naples, among

whom, if press reports are true, cholera evidently made its appearance during the voyage, its existence being either not recognized by the ship's surgeon, or else concealed by the deliberate falsification of the ship's sanitary record, has already, in the opinion of your Committee, seriously increased the present danger of the ultimate introduction of cholera into the country through the port of New York. It would seem that if the importation of immigrants directly from a European port notoriously infected, is not to be temporarily prohibited as a necessity of public safety, or if the treatment of these immigrants, after their arrival at the New York quarantine station, is not to be immediately and radically improved, our protection against an epidemic at the present time must rest mainly upon the fortunate circumstance of the near approach of a season in which the disease does not usually spread. The continuance of cholera among the passengers of the "Alesia" so long after their removal to the station of observation, in itself demonstrates the inefficiency of the measures which have been adopted and enforced for its extinguishment there. Although we have not yet heard of the development of the disease anywhere on the main-land, nevertheless, in view of the almost uncontrollable tendency of cholera to spread at times, and of the original insufficiency and the present faulty constitution of the police force on Hoffman Island, we feel impelled to believe that the immunity up to the present time has been owing to singular good fortune, rather than to good management.

Moreover, in our opinion, it is necessary that the personal effects of Italian immigrants directly from the infected ports shall be, in all cases, thoroughly disinfected before they are permitted to land, whether the word cholera

makes its appearance in the ship's log and the sanitary record of the voyage or not. It is a well-known fact, established by numerous instances, that even when immigrants from an infected locality have themselves remained free from disease during the voyage, their baggage, packed before starting, has been the conveyer of the infection to their point of destination. The passengers of the steamship "Independente," most of whom were shipped directly from the infected port of Palermo, although it is stated that during the voyage no case of cholera developed, come under this category. The recent action of the Surgeon-General of the Marine Hospital Service, and the alarm of the health authorities of the cities of Chicago and St. Louis, seem, therefore, not without some just foundation.

It should be stated, however, that we have learned through the medium of the public press that an attempt has been made to remedy a few of the defects above pointed out. What has been done would appear, however, to be in the direction of improvement in minor matters, rather than in such radical changes as would insure the country against the dangers to which it is exposed.

In the conduct of its personal investigations, and in the preparation of its report, your Committee has dealt solely with patent facts and plain truths which would meet the eyes and occur to the minds of any unprejudiced and competent men charged with a similar duty. To lay the simple statement of these facts before physicians who are in possession of modern knowledge concerning the nature, cause, mode of production, and means of prevention of such a virulently infectious disease as Asiatic cholera, is to prove beyond rational dispute that the

present quarantine, as a safeguard at the ports under consideration, is dangerously and essentially imperfect.

It is natural, after having made our comments on the defects of the quarantine stations we have described, that we should endeavor to point out their causes and probable remedy. There is one cause so prominent, that we may dwell on that alone. It is the great expense. Were it not for the question of money, there would have been physicians constantly in attendance at the New York station, and, consequently, better management and discipline would have been maintained, while at Philadelphia and Baltimore there would have been adequate establishments provided for the isolation and observation of large bodies of immigrants.

Municipalities and States are wont to scrutinize every dollar of their money appropriations, bringing their expenses down to the closest living limit. Quarantine in this country being, as a rule, enforced mainly against yellow fever and smallpox, a mistaken economy has caused no provision to be made for the more perfect establishments absolutely required for protection against cholera.

Philadelphia, Baltimore, and other ports of a more limited commerce, are unable to spend as much on their stations as is New York, with its large revenues from that source, yet an inefficient quarantine at any station exposes the whole country to the dangers of the importation of disease. But it is manifestly unfair that a single municipality or State should defray the expense of protecting the whole public.

How, then, can we have equally complete stations all along the coast? We believe that this can be effected by putting quarantine into the hands of the National

Government. We know that there are legislative difficulties in the way; that quarantine partaking of the nature of police regulation, its exercise, it may be claimed, belongs to the local authorities. Yet, even if it be conceded to be a police regulation, its scope is not local, but extends over the whole country, and it would seem, in justice, that it should be exercised and paid for by the whole country. Objection is sometimes made to quarantine on the ground that commerce is unduly interfered with, or even destroyed. A modern quarantine, however, does not necessarily involve the detention of cargo, nor prolonged detention of the passengers. It is now known that in the case of cholera the disease germs infest the persons, clothing, and surroundings of the passengers and crew, while the cargo, except in some rare instances, is free from infection. Non-infected vessels require no detention whatever, the health officer examining them in transit.

Not to speak of the danger which threatens the whole country, the exposure, suffering, and loss of life that have occurred among the passengers of the "Alesia" detained at the quarantine of observation on Hoffman Island, have been due to the imperfect manner in which the measures of quarantine have been there carried out. Had the details of isolation and disinfection set forth in the earlier pages of this report been immediately and effectually put in force, the passengers who were not already infected at the time of leaving the ship, and this includes the whole number with very few exceptions, might have been released from quarantine in eight days, without the slightest risk to the country.

The thanks of the Committee are due to the quarantine authorities of New York, Philadelphia, and Baltimore

for courtesies extended to it in conducting the investigations upon which this report is based.

Your Committee offers the following resolution:

Resolved, that in order to secure concerted action among the medical societies of the United States looking to the early adoption of a uniform and efficient quarantine of all exposed ports, the Committee be continued and be authorized to issue an address to the medical societies of the country, and seek their coöperation.

All of which is respectfully submitted.

J. C. Wilson, *Chairman.*
E. O. Shakespeare,
R. A. Cleemann.

[After the reading of the preceding report.]

Dr. John C. Peters, of New York, said: I am very glad to have heard this report. In New York we have been anxiously waiting for it. Still, I think that cholera is stamped out at New York, and if the country has not already been infected by persons or baggage from other ships, it is comparatively safe.

The history as regards the "Brittania" is a very curious one. She had a voyage of over three weeks, and there was apparently no cholera on board. I happened to be at the quarantine station when the report of the surgeon was sent in—a long and tedious document, containing many trivialities. Only three serious cases were mentioned, and all of these terminated in death. One was, I think, a case of so-called cholera infantum. The second was said to be a case of perforation of the bowels by worms, although there was no post-mortem to verify the diagnosis. But it was the third case which most attracted my attention—it was one of so-called sea-sickness developing late in the voyage. There apparently had been no cholera, and nothing that looked very much like that disease. It so happened, fortunately for New York and the rest of the country, that no less than five physicians went down that day to consult with the Health Officer, otherwise the "Brittania" might have been released, as was the "Independente." I think that had I been the Health Officer, I might have released the ship. It was, however, decided to detain the vessel for these reasons: She had come from an infected port, and although the voyage had lasted three weeks we thought it right to examine matters for ourselves; and, in the second place, the descriptions of the cases of severe sickness were so unsatisfactory that we could form no intelligent opinion about them. Since then a certain amount of cleaning and disinfection has been going on on board the ship, and the precaution has been adopted of removing all those who came in close contact with the sick to the lower island for observa-

tion. I think that the whole number of cases of cholera on board the "Brittania" has been five and that there has been none for three days.

The accommodations on Hoffman Island are so meagre for the numbers that have been landed, that the relatives and associates of those who had sickened on board the "Alesia" or had died, were placed in a room with others. It fortuitously happened that all of these were placed together in the lower room of the north building with one hundred and fifty to two hundred others. All of the cases of cholera, with one exception, have developed in that room. These cases were nearly all traceable to those who had sickened or died on the "Alesia." I have no doubt that the latter cases could be traced specifically to cases in Italy. I think that if these infected persons had been placed by themselves, there would not have been so much necessity for the separation of the immigrants into small groups. It was at first thought that there was no place to put these people, but I saw in a newspaper report that there is on the island a large, empty building that is habitable. It is, however, not furnished with water-closets and other conveniences. It is proposed to spend $2500 on the building to convert it into a place of observation.

I am certain that many in New York feel deeply grateful to the Philadelphia physicians for their report; this, with the efforts of those in New York, has already produced an effect which could not have been brought about before: the quarantine commissioners are now willing to put their hands in their pockets to make the necessary outlays. The Health Officer of New York is perhaps the most unpopular man in the country, and has been so from the very moment of his appointment, for the reason that he came from a small town and not from the city. He is, however, not wholly to blame for the state of affairs which exists. The whole amount of quarantine fees at New York is necessarily large. It has been estimated at from $100,000 down to $40,000. The latter sum, I think, is entirely too low. This money is supposed to go into the hands of the Health Officer, who expends it; but no one is required to give

an account of the expenditure of that office. The fact is, however, that the Health Officer is paid only about $10,000 a year, and the other expenses are about $17,000. So that about $27,000 are given to this department. The rest of the money fades away and cannot be traced, but is supposed to be used for political purposes. The State should not permit this condition to continue much longer, but must insist that the receipts shall be spent for the purposes for which they were intended. The Health Officer from his salary is unable to employ other medical services, and it is here that the point comes in.

I think that the physicians of New York were unaware of the condition of affairs on Hoffman Island until their attention was called to it by the visit of a member of your Society.

I find nothing to object to or to contradict in this report. I think that under the circumstances we have been very fortunate. There has been no water contamination marked by suddenness and great severity of the outbreak. There has, I think, been only one case of cholera on Hoffman Island in over three weeks. I believe that the disease has completely faded out or has been stamped out. I hope that the latter is the case.

On my way down to the island, I met one of the most noted sanitarians of this country, who has been in frequent consultation with the Health Officer. At that time no case had occurred for a week, and he was certain that the disease was stamped out. I found the island wonderfully clean. There was not the slighest nuisance anywhere on the grounds. The floors of the rooms were disinfected every day with corrosive sublimate solution. As I have before mentioned all the cases of cholera, with one exception, developed in the lower room of the north building. These were the dirtiest of the three sets of immigrants and I believe that all of those closely associated with the sick on board the ship were placed in this room. One hundred and fifty people lived there a month, sleeping there every night, and none of them contracted the disease except relatives and messmates. In the room above there were the same number of people and only one case of the disease. In the south house, where the more respectable people were placed,

there has not a single case of cholera developed. I think that those in the south house and those in the upper rooms of the north house could be released without danger.

One of the most objectionable features has been the use of one dish by a number of persons in common. I believe that in order that the poison of cholera may become operative, it is necessary that it shall get into the stomach and bowels. The only precaution which I use in cases of cholera is to carry my own towels and never to employ a basin for washing my hands. I have the water poured from a pitcher or from a tap.

I do not think that we will have a severe outbreak of the disease anywhere in the United States. It is possible that persons with preliminary diarrhœa may go from place to place and leave the germs of the disease, and that these may find their way in some manner into the food or drinking water of others.

Dr. E. O. Shakespeare said: I should like to make one or two remarks suggested by Dr. Peters's interesting description of his visit to Hoffman Island. The remarks which have been made with reference to the "Brittania," confirm the opinion which I had formed from the accounts given in the daily press. This is an illustration of a defect which has often repeated itself in the history of cholera. Vessels often come to the ports of a country with clean bills of health and with the positive statement that there has been an entire absence of infectious diseases during the voyage, and yet these very vessels have oftentimes been the means of the distribution of cholera. The "Brittania" seems to have been in a much worse or a more suspicious sanitary condition than the "Independente" as far as can be ascertained from the published reports. As we know, the latter steamer was allowed to land its passengers after a detention of twenty-four hours, without any effort being made to cleanse the passengers or their effects before they were allowed to proceed to their various points of destination.

The indefinite record of the sanitary condition of the "Brittania" and the subsequent history of some of the passengers of

that steamer, indicate very clearly that two of the cases which died were probably cases of cholera. I found on examining the record of the "Alesia" the occurrence of two or three suspicious cases which could very well have been light cases of cholera recorded previous to the time when, according to the statement of the surgeon, the disease first appeared.

These facts warrant, and, in fact, create the necessity for the treatment at the New York quarantine of all passengers coming at the present time from the infected ports in Italy and Sicily, in precisely the same manner as if they had come into port with cholera on board or a history of cholera during the voyage. It is the bounden duty of some one, either the New York authorities, or the National Government through the Marine Hospital Service, to see that, if these immigrants are not temporarily prohibited from coming to this country, proper precautions as regards disinfection be enforced. Much of the baggage of these people is packed in the localities whence they come and this is likely to contain the infectious agent of cholera, which may be kept alive until their final destination is reached. When this clothing is unpacked and handled under favorable circumstances, cholera is likely to appear. It seems to me that while at the present time we may be free from the danger of the introduction of cholera from the "Alesia," yet we are even more exposed from the introduction of the disease by the infected baggage of immigrants on ships with clean bills of health, especially if these vessels are not detained sufficiently long at quarantine to permit of the disinfection of the baggage and for the observation of the immigrants for a time equal to the period of the incubation of the disease, say forty-eight hours or a little longer.

The only other point that I would refer to is the disposition of the immigrants at the time that they were transferred from the "Alesia" to Hoffman Island. As I understand it, the visit of Dr. Peters was some time after the visit of the Committee of this College, and the latter visit was a week or more after my first visit as an individual. I reached the island four or five days after these people had been landed. At that time the

process of disinfection was going on in the south building, in the lower rooms of which the disinfecting chambers were located. The upper story of that building was uninhabitable in consequence of the permeation of the fumes of sulphur through the floor. At that time there were no people occupying the second story of the other large building. That room had been cleansed and gotten ready for the occupancy of those of the passengers who could have access to their baggage already disinfected. It was intended that after changing their clothing they should go into this room and be more or less separated from those who were still wearing their dirty clothing. So that five or six days after the arrival of these people nearly all of them were occupying the one large room on the first floor of the north building, huddled together like sheep when they were all in place with an intermingling of the sick with the well. After this, I have no doubt that things began to improve, for there were many points incidentally referred to as somewhat objectionable, although I was not specifically requested to make any suggestions, my visit being intended simply for the investigation of the cholera stools.

The steam vat for the boiling of the clothes previous to fumigation was put in place on the last day of my first visit, a week after the arrival of the steamer. The official statements of the Health Officer are so worded as to imply that this steam vat was in operation conjointly with the sulphur fumigation.

After the people began to occupy the other rooms, there was no effort made to keep one set separate from the other. The only part of the island to which all of the passengers did not seem to have access was the second story room of the disinfecting building. It is very natural that in that one room in which all of the immigrants were huddled together for from six to eight days, eating under unfavorable conditions and sleeping under such circumstances as would be liable to transmit the disease from one to the other, all of the new cases of cholera should have developed.

Under the circumstances, I do not think that the fact that all the cases of cholera developed in that room should be taken

as a sufficient basis for determining when certain groups should be permitted to leave the island. I, however, agree with Dr. Peters in the opinion that many of these people can be safely discharged. I base this rather upon the fact that no case of cholera has appeared during the past eight or ten days, rather than upon the fact that cholera has not appeared in certain rooms.

Dr. Joseph F. Edwards said: In this report there have been several references to fumigation by sulphur. It might be well to call the attention of the College to the fact that at the recent International Congress of Hygiene at Vienna, one of the conclusions adopted by that body declares that fumigation by sulphur for purposes of disinfection, should be abandoned as utterly useless.

Dr. Lee said: I wish simply to express my sense of the obligation under which this committee has placed the city of Philadelphia and the entire country by the admirable report which it has made. But I think that the Committee would bear me out in saying that it would be impossible to carry out at the port of Philadelphia, with the means which are at command, the requirements which it has laid down. The State Board of Health has been laboring from the first day of its creation to obtain better protection for this port in the matter of quarantine. It has been in communication with the State government, with the United States government, and with the Boards of Health of this State and those of New Jersey and Delaware. It deeply feels the responsibility that rests upon it for obtaining at as early a day as possible a more efficient station, sufficiently large in area, sufficiently protected by isolation, and sufficiently provided with all the modern means of disinfection, to which such an immense city as this is certainly entitled.

THE CLINICAL VALUE OF THE CARDIOGRAPH.

By

THOMAS J. MAYS, M.D.,

PROFESSOR OF DISEASES OF THE CHEST IN THE PHILADELPHIA POLYCLINIC

[Read September 7, 1887.]

The graphic method sustains the same relation to physiology and to pathology as the microscope does to histology. The latter magnifies almost infinitely small objects, while the former traces and measures the movements of living organs, in health and in disease, not otherwise discernible. Cardiography, a special department of this method, although having been introduced many years ago by Marey, Landois, and others, is comparatively unknown, especially in its clinical applications, and for this reason I beg to give some illustrations of the value which the cardiograph possesses in the diagnosis and prognosis of cardiac diseases.

This instrument, as is here shown, consists of two air-drums connected with rubber tubing. One drum carries a small button on its diaphragm which, with proper supports, can be accurately adjusted to the thorax directly over the seat of the cardiac impulse. The other air-drum carries a lever, the extreme end of which rests lightly against a smoked revolving cylinder. Through the medium of the air in the rubber tubing

the cardiac impulse is transmitted from the drum carrying the button to the one carrying the lever, and its form and dimensions are then graphically portrayed on the smoked surface of the revolving cylinder.

FIG. 1.

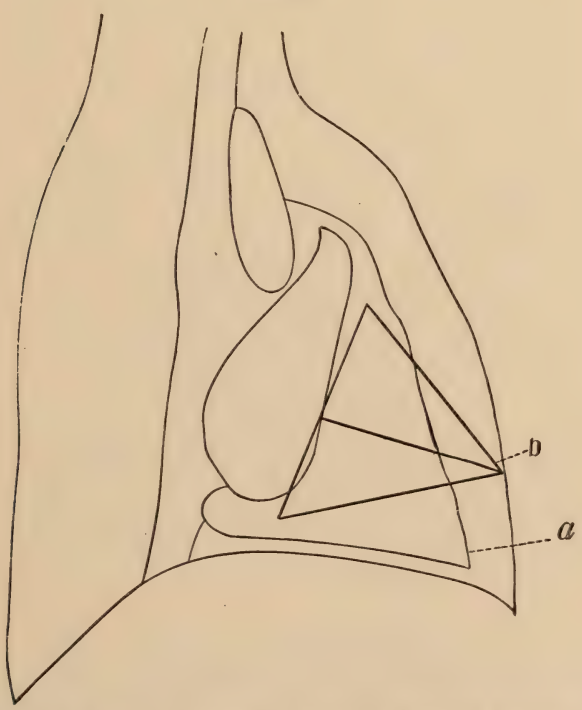
Fig. 1 represents a normal cardiogram very much magnified—*a* to *c* comprising the systolic and *c* to *e* the diastolic portion of a cardiac cycle. In analyzing this it may be divided into four sections—from *a* to *b* constitutes the up-stroke, or line of ascent; from *b* to *c* constitutes the apex-wave; from *c* to *d* constitutes the down-stroke, or line of descent; and from *d* to *e* constitutes the line of ascent of auricular contraction.

During these successive periods the following phenomena occur:

1. The up-stroke, or line of ascent (*a* to *b*), is caused

by a lengthening of the longitudinal axis of the left ventricle and by a spiral upward movement of the apex during contraction which gives a shock to the thoracic wall in the region of the fifth intercostal space. (See Fig. 2.) During this period the auriculo-ventricular

FIG. 2.



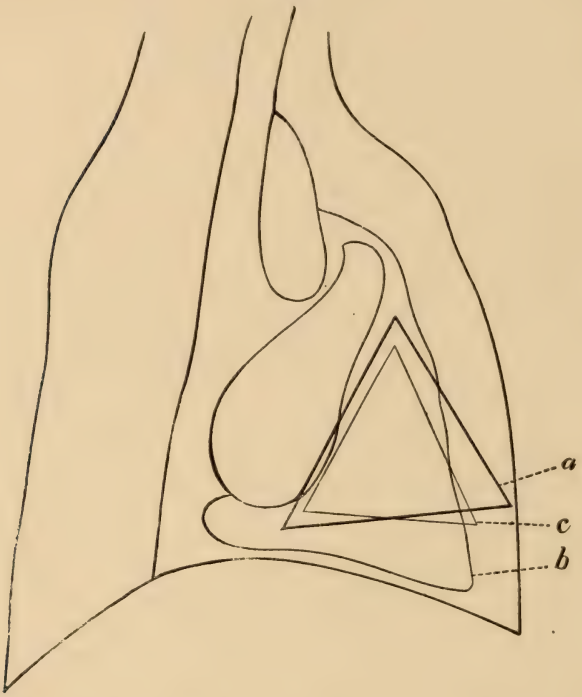
Side view of heart. *a* represents position of heart in diastole, and *b*, in systole. (After LUDWIG.)

valves close, the semilunar valves open, and the first wave of blood is expelled from the ventricles.

2. The apex-wave from *b* to *c* is an undulating line and is produced by an intermittent recession of the apex from the chest wall due to the shortening of the

longitudinal axis of the left ventricle (see Fig. 3). This line describes the conflict which is waged between the force of the blood in the ventricle and that in the

Fig. 3.



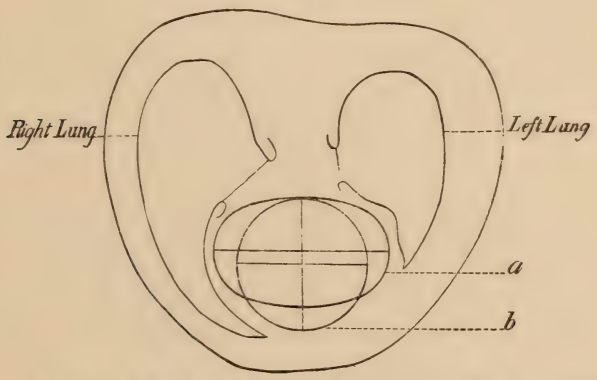
Shows the cardiac shortening during contraction. *a* represents the systole and *b* the diastole of the heart, while *c* represents the heart between the beginning of systole and complete diastole—the period of fullest contraction.

aorta, and its duration and regularity are in direct relation to the amount of resistance, either negative or positive which the left ventricle encounters in expelling its contents. At the end of this period the semilunar valves close.

3. The down-stroke, or line of descent from *c* to *d*,

marks a rapid fall of the lever, and is caused by the apex of the heart being entirely withdrawn from the chest wall—the transverse diameter of the heart being much greater now than the antero-posterior. This is a portion of the ventricular diastolic period (see Fig. 4). From *d* to *e* is the other portion of the ventricular diastole, and this part indicates the period of auricular contraction.

FIG. 4.



Horizontal section of heart and lungs. *a* represents the circumference and diameter of ventricle during diastole. *b* represents the circumference and diameter of ventricle during systole. Showing that the antero-posterior diameter is much greater in systole than in diastole. (After LUDWIG.)

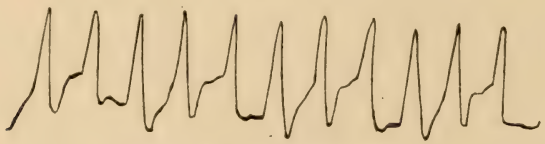
Before advancing any further, it may be stated that, useful as this instrument is, it has its limitations in practice. Its principal value is in taking tracings of affections of the left side of the heart, and this only when the apex beat is felt sufficiently strong against the thoracic wall, but when this condition obtains, a true outline, characteristic of each cardiac affection, can be taken.

The clinical cardiogram presents to us three principal

points for consideration: (1) The up-stroke; (2) the apex-wave; and (3) the down-stroke.

(1) The up-stroke, or line of ascent, is long when the ventricular walls are powerful, when the volume of blood in the ventricle is firm, and when the amount of resistance to the outflow is small; and it is short when the contractility of the heart is diminished, when the resistance to the outflow is great, and when the volume of blood in the ventricle is small. Hence the highest up-strokes are obtained in the hypertrophy of aortic regurgitation without mitral regurgitation (see Fig. 5), and the shortest in mitral regurgitation with dilatation (see Fig. 8).

FIG. 5.



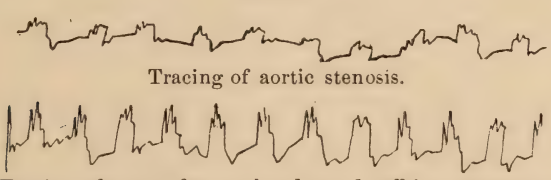
Tracing of aortic regurgitation.

(2) The apex-wave is sharp and pointed when the diastole follows closely on the systole, and when the blood is firmly grasped by the ventricle; and is broad and indentated when there is a leak behind, or an obstruction in front. Hence the sharpest apex is found in aortic without mitral regurgitation, and without stenosis of the aortic valve (see Fig. 5), and the broadest is found in mitral regurgitation (see Figs. 7 and 8) and in aortic stenosis (see Fig. 6).

The cause of the broad apex-wave in mitral regurgitation and in aortic stenosis is rather more complex than appears on the surface. That of the former condition is due to the fact that during systole the blood is expelled

in two directions—through the normal aortic and through the leaky mitral valve—and this being so, the systole is in all probability prolonged to a period beyond the time it takes for the ventricle to empty itself, because it empties itself more rapidly under such than

FIG. 6.



Tracing of aortic stenosis.

Tracing of same after twelve days of caffeine treatment.
Showing the beneficial action of caffeine.

under normal circumstances; or, in other words, under normal conditions of the mitral valve the whole amount of blood would have been expelled through the aortic valve, and the lever would have described a curve with an apex more or less sharp, but in mitral incompetence the same volume of blood may be in the ventricle at the beginning of systole; but owing to the leak in the mitral valve, a part of the blood which would have passed the aortic orifice, now flows back into the left auricle, and the whole amount of blood is then expelled in less time than under normal conditions. The ventricle, therefore, remaining in systole the whole length of time required to contract under normal conditions, does not change its form at this period, and the lever describes a curve with the sharp apex broken off at the point where the last blood was expelled.

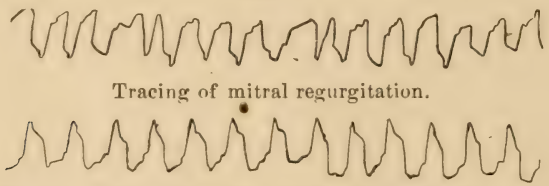
The interpretation of the curve of aortic stenosis is, perhaps, less difficult. In the normal condition the contractile force of the ventricle exceeds that of the arterial

circulation, but in aortic stenosis the superinduced obstruction in front adds another obstacle; and, hence, the contraction in this form of valvular disease is slow, laborious, and incomplete—the ventricle meanwhile undergoing but little change in form, and hence the apex-wave becomes more or less lengthened out.

(3) The down-stroke, or line of descent, is lengthened and shortened in the same conditions which lengthen and shorten the up-stroke.

In the next place I wish to call attention to the value of the cardiograph, as an instrument whereby we may be able to ascertain the influence of therapeutic agents on the heart, as well as an aid to prognosticate the outlook of the patient. By taking tracings at stated intervals we can obtain reliable information as to whether the cardiac difficulty is improving or not. The patient's feelings are often a fair index as to the general

FIG. 7.



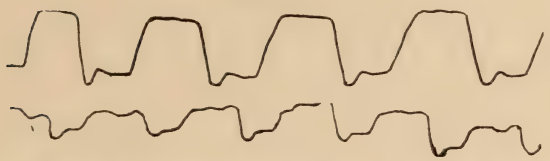
Tracing of mitral regurgitation.

Tracings of same after three weeks of digitalis treatment.
Showing the beneficial action of digitalis.

condition of the heart's action; but the loudness, or softness, or even partial disappearance of a murmur is not proof that the patient is better, or the reverse; hence the tangible evidence which the cardiograph affords is at once reliable and satisfactory to a high degree. (See Figs. 6, 7, 8.)

Fig. 8 is the tracing of an aggravated case of mitral

FIG. 8.



Two tracings taken eight months apart, from a patient aged twelve, who suffered from mitral regurgitation. First tracing was taken when she felt comparatively well, and the last about one week before her death.

regurgitation, and, from a prognostic point of view, is very interesting. The difference between the two tracings represents the variation which took place in the dynamic condition of the patient's heart during the last eight months of her life.

REMARKS

IN

REGARD TO DR. FINLAY'S RESEARCHES WITH REFERENCE TO THE BACILLUS OF YELLOW FEVER.

By

S. WEIR MITCHELL, M.D.

[Communicated October 5, 1887.]

Dr. Finlay, of Havana, has been studying yellow fever, and believes that he has made a series of valuable discoveries. He has sent me some of the cultures which represent the bacteriological forms he has found. Some of these I sent to Dr. William Welch, of Baltimore, and some to Dr. William Osler, of this city.

Dr. Finlay suspected that the mosquito was the agent in certain cases in the transfer of the poison of yellow fever from one person to another. He has made a series of experiments on this subject which were set forth in a paper published in the *American Journal of the Medical Sciences* two years ago. He has finally, as he believes, succeeded, by placing the mosquitoes on the skin of a man affected with a severe form of the disease and then transferring them to persons who never had the disease, in giving the latter a mild form of the disease.

I believe that Dr. Finlay proposes to present a paper

to the College, giving the discoveries which he has made and the proof which supports them.

[Dr. Dock, at the request of Dr. Mitchell, exhibited the cultures referred to above. He first read from a letter from Dr. Finlay in which the writer stated that he had proven the transmissibility of yellow fever through the bite of the mosquito; that he had demonstrated a specific tetragenous microbe in the blood, in the serum of blisters, and in the skin; and that he had obtained this same microbe in mild cases of yellow fever, developed to all appearances from mosquito inoculation.]

Dr. Dock then said: Dr. Finlay has sent three hanging drop cultures and two agar-agar cultures. I have under the microscopes some of the drop cultures and some of the stained cultures from the agar-agar. The tetragenous microbe in the drop culture seems to have been taken from the agar-agar cultures. I have made cultures from the tubes sent by Dr. Finlay, and as far as they have gone they are rather different from any coccus that I am familiar with, although it has striking points of similarity to the ordinary tetragenous micrococcus of Koch and Goffard. My examination has, however, not gone far enough to enable me to say anything definite.

Even if this micrococcus is not the same as the ordinary tetragenous micrococcus, there is no absolute proof that it is the cause of yellow fever. Even supposing that the mosquito had been sterilized at the time that it took the microbe from the patient, one generation would hardly be enough, nor would inoculation from this sterilized mosquito be enough to place the relation between the mosquito and yellow fever beyond all question. I have to-day inoculated some gelatine with native mosquitoes and shall wait to see what sort of microbes will develop.

[After the reading of the preceding paper:]

Dr. E. O. Shakespeare said: I remember reading, with interest, the first communication of Dr. Finlay, to which reference has been made, and it is with additional interest that I listen to this communication to-night; but I must say that it did not seem to me that the method of obtaining the microorganism was as free from criticism as we should desire, where it is proposed to show that a certain affection is due to a certain bacterium. I would agree entirely with Dr. Dock in the criticism which he has made, and I would say further, that it seems to me that this is an exceedingly faulty way of attempting to isolate the microörganisms which may or may not be peculiar to yellow fever, but which are believed to be present in the blood, and drawn from it through the skin. It is well known that every animal, as well as every object which is exposed to the air and comes in contact with other objects, is covered with different species of bacteria, and I cannot conceive any reason why the mosquito should be an exception. The beak of the mosquito, as well as other portions of its body, is undoubtedly covered with numbers of bacteria. It does not appear from the communication that control experiments have been made. It is, therefore, impossible to avoid suspecting that this organism which has grown upon the culture medium, is simply saprophytic and has nothing whatever to do with the production of yellow fever.

It is extremely difficult to extract the blood from the body and to be sure every time that you have no extraneous contamination of the blood which you draw out, or of the material which you inoculate with that blood. Even when the most rigid precautions are taken, such as using, in the first place, powerful disinfectants, on the skin, to kill all the bacteria that are on its surface, and also to affect those which may be present in the deeper layers of the epithelium, it is difficult to

prevent accidental contamination, and we are not informed that even these precautions were taken.

It does seem from this communication, which is brief, and, therefore, lacking in detail, that the method used in obtaining these micrococci was an exceedingly faulty one. We are far from having any unassailable proof that the organism presented here has anything to do with the etiology of yellow fever. I, myself, believe that in course of time we shall learn that yellow fever is one of those infectious diseases which are due to the agency of a specific microörganism, but whether that organism has yet been discovered either by Dr. Finlay or Dr. Freire remains to be proven by subsequent investigations conducted under unassailable methods.

MEDICAL MATTERS IN CHINA.

By

H. W. BOONE, M.D.

[Read by invitation, October 5, 1887.]

Mr. President and Gentlemen: My only excuse for appearing before your distinguished body is that China is a very far off country; here, at home, but little is known of us or of our work. The native medicine and surgery of China need not delay us, they are too crude to be of any value. There are about sixty European general practitioners of medicine located at the treaty ports, and engaged in practice among the foreigners who have settled in China. The greater number of these are British; Mauson, of Amoy; Reed, of Hankow; Jamison, of Shanghai, and others among them have done good service in the cause of medicine. Dr. Peter Parker opened the first medical mission work in Canton fifty-three years ago. Now we have eighty medical missionaries (some ten or twelve of the number are women). Some of the medical missionaries are at the treaty ports, many are working in the interior, far away from all European associations. In the larger treaty ports we find hospitals for the Europeans, and hospitals and dispensaries for the Chinese. The only regularly organized medical society in China is the "Medical Mis-

sionary Association of China." Dr. Kerr, of Canton, is the President, and there are five vice-presidents, one for each district. All medical missionaries are active members of this Association now; missionary physicians are honorary members. They pay no dues, and have all the privileges of members, except that of voting on the business of the Association. The Association was represented by its delegate at the International Medical Congress which held its meetings in Washington last September. Dr. George Post, of Syria, and the delegate from China, were placed on the Committee of Arrangements to decide the place of meeting for the next Congress, thus giving the public recognition of the Congress to medical missionaries and their work. Drs. Hodson, Kerr, Osgood, Dudgeon, Mr. Foger, and others, have done good work in translating fifty-three works, representing nearly every department of medicine, into Chinese for the use of native students of medicine. The greater number of the hospitals for the Chinese are in the hands of the medical missionaries, though a few at the treaty posts are managed by medical men who are not missionaries.

The use of antiseptic surgery in a thorough manner is gaining ground slowly, and only a few of the medical men carry out this line of treatment fully. St. Luke's Medical Missionary Hospital was the first mission hospital in China to carry out the antiseptic system in all its details. As I am surgeon to St. Luke's Hospital, and consulting surgeon to the Women's Hospital at Shanghai, I shall describe our work in that district. Shanghai is in latitude 32, north, at the mouth of the Lang Laze, the great river of China, it is in a great, low-lying and fertile valley. We are subject to all the

diseases to which flesh is heir. Those most peculiar to our locality are malarial and typhoid fever, diarrhœa, dysentery, and liver troubles. Cholera is seen every year, and occasionally becomes epidemic. Beri-beri is seen from time to time. As I have more to do with surgery than with any other department of the work, my remarks will be chiefly confined to this branch of the subject.

Injuries of the skull are common, and are treated very much on the same line as they would be in the hospitals at home. Eye diseases are very prevalent; purulent conjunctivitis is a common affection, and granular lids and entropion are frequently met with. We see a good deal of strumous ulcer of the eye and syphilitic diseases of the eye. Cases of staphyloma and of cataract are common. Purulent discharge from the ear and the effects resulting from it are very often observed. I may remark, in passing, that all diseases and injuries seen in China come to us but little affected by any treatment, except when a native doctor runs his needle into an eye, the spinal column, the peritoneal cavity, or an injured joint. As these needles are rusty, and are never cleaned, but used indiscriminately upon all cases, they form a potent means for spreading disease, and of producing blood poisoning. Diseases of the jaw-bones calling for surgical operation are of common occurrence. The total neglect of the teeth, and lack of even the knowledge needed for their extraction, lead to much disease of the jaws. We see a great many tumors of the neck, and are frequently called upon to make deep dissections for their removal. These operations, although requiring care and judgment on the part of the operator, are very satisfactory in their results.

Strumous enlargements of the glands of the neck are common. We dissect them out. Sometimes the operation is easy, sometimes it requires careful dissection of the deeper parts of the neck. We sometimes curette out the contents of suppurating glands, but, as a rule, prefer to excise them entire. Aneurism is more than ordinarily prevalent amongst the European community, but comparatively rare among the Chinese. The Chinese drink less spirits than any other nation. Can this help to account for their apparent freedom from aneurism, and for the fact that, as a general thing, they do well under surgical treatment? We see cases of pleurisy with effusion, and of empyema, also injuries of the ribs where necrosis has taken place. We sometimes have to remove very large portions of the ribs, and to gouge out parts of the transverse processes of the vertebræ when they are also involved in the disease. Laparotomy for wounds of the intestines, and the opening and draining of abscesses of the peritoneal cavity, usually give us good results. Abscess not connected with bone disease, sometimes single and of enormous size, sometimes multiple, is common. When opened by long incision, scraped, drained, and dressed aseptically, they do well. Tumors of every kind and of all parts of the body are common. Elephantiasis scroti, we cure by operation. When affecting the leg we have tried the German plan—excision of a large part of the mass, and bringing the flaps together with provision for free drainage. A great deal of milky fluid exudes, but the ultimate results of this operation have not been satisfactory. The parts heal up well, but the disease returns. In elephantiasis of leg when there is an exacerbation, with fever, pain, and local heat: rest in bed, elevation of

limb, low diet, and salines, followed by the use of the elastic bandage, give good results. Cases of leprosy are occasionally seen. Abscess of the liver is met with in Europeans and Japanese, rarely in the Chinese. Our latest plan of treatment is to open the abscess, hunt for and open more places (if the abscess is multiple), wash out the cavity freely with a hot saturated solution of boric acid, and dress with salicylic wool and absorbent cotton. The patient is placed so that the drainage through the rubber drain tubes will be favorable, and the wound dressed under the spray every day. Recovery is more rapid by this method than by any other. In hernia we aim to obtain a permanent cure by tying and twisting the sac, and by suturing the pillars of the ring. After the wound has healed, a pad, made from a plaster cast of the region, is fitted to a truss, and the patient advised to wear it for six months, when he is allowed to dispense with its use. Our results are satisfactory. The Chinese have no means for the treatment of stricture, and the use of a catheter is unknown to them. Thousands of the natives die every year from the results of neglected stricture. We prefer gradual dilatation when it can be done. Internal urethrotomy and perineal section are reserved for traumatic stricture. Stone in the bladder is seldom found at Shanghai. We have a great many cases of neglected fistula in ano, often with eight or nine sinuses. These are laid open, scraped, and dusted with iodoform, and usually do well. We prefer the clamp and cautery for the removal of piles, and have relieved many patients by this method. Dislocations of joints are very common, and are never cured by the native doctor. Fractures are common, and are never treated by the natives. Bones unite at any angle, and

we see cases of ununited fractures on which we sometimes operate. We find bone drills (flat) with any eye at the point which can be threaded with a loop of silk before they are withdrawn, useful in getting the stout silver wire into its place. Diseases and injuries of the bones and joints are common; we have to operate for necrosis, and cases of purulent synovitis, especially of the knee-joint, are common. When opened freely, with aseptic precautions, and drained, these cases do well. We frequently perform resection of joints. We amputate as seldom as possible, in deference to the belief of the native that if his limb is removed while he is in this life, he must go without it through all eternity.

Gynecology is in its infancy in China; thousands of women and girls come to St. Luke's and to the Women's Hospitals for relief from ordinary diseases, and for general surgery, but it is difficult to persuade them to submit to special gynecological treatment. We have had but few cases of ovariotomy in Shanghai. Taking all the hospitals together, the mortality has been about fifty per cent. All of the cases operated upon have been in an advanced stage of the disease. Numerous and extensive adhesions and feeble patients have aided in swelling the mortality report quite as much as the want of experience of the operators in this special line of work.

St. Luke's Hospital was built on land purchased almost entirely with the donations of rich Chinese. It is supported by local contributions of Chinese and foreigners, and by the income from the first-class patients. Several other native hospitals are wholly, or in part, supported in the same way. Our need is not for help in our hospital work. We want to extend and to improve the opportu-

nities for the medical education and training of Chinese men as physicians and surgeons. About one hundred natives are now engaged in the study of medicine and surgery in China. Dr. Kerr has a school in Canton. Drs. Park and Phillips are teaching in Soochow. We in Shanghai have a school with four lecturers. So far as I know, all the other teaching is done by some one medical man taking a few pupils and teaching them by his own individual effort. Shanghai is the central point of trade and of travel for China; more people come and go there than at any other point; it is easy of access. The journal of the Medical Association is published there; the secretary of the Association lives in Shanghai. We have the nucleus of a medical library and of a medical museum. We wish to ask the members of the medical profession in this country to help this attempt to give the Chinese regular medical education. We take men on trial for three months, then keep the capable ones only, and make them sign an agreement to remain and study for four years. We ask you to donate to our medical school teaching apparatus, diagrams, atlases, anatomical preparations, laboratory apparatus; books for our library, and specimens for our museum. Help us to teach the Chinese how to help themselves. All donations sent to Dr. H. W. Boone, Bible House, New York, will be thankfully received.

MEMBRANOUS ENTERITIS, WITH A REPORT OF CASES.

By

WILLIAM A. EDWARDS, M.D.

INSTRUCTOR IN CLINICAL MEDICINE AND PHYSICIAN TO THE MEDICAL DISPENSARY IN THE UNIVERSITY OF PENNSYLVANIA;
PHYSICIAN TO ST. JOSEPH'S HOSPITAL.

[Read November 2, 1887]

That a substance, probably mucous in character, is occasionally voided at stool has been recognized for many years, indeed, by the very fathers of medicine; it is recently, however, that these cases have received careful attention and classification in our nosological tables. The disease seems naturally to divide itself under two headings, (1) cases in which the passage of the membrane is accompanied by all the symptoms and concomitants of enteritis or entero-colitis in their acute or chronic form, and (2) cases in which the passage of the membrane is about the only symptom presented.

With the former series of cases we have little to do in the present paper; suffice it to say that the cases have been noted and observed for many years. To Morgagni, however, is due the credit of first clearly recognizing the fact that such matters in the stools were not portions of the intestinal canal, as then considered, but were occasionally false membranes.

The disease is unfortunate in the fact that it has received many varied and totally different synonyms,[1] thus giving evidence of the chaotic state of medical opinion in regard to the affection.

The *etiology* of membranous enteritis has fared but little better than its nomenclature, as the most varied and opposite etiological factors have been adduced in endeavoring to elucidate the problem. Age is a prominent predisposing factor, as most cases occur in adult life, my own cases following the rule; the decade between thirty and forty is that which presents the greatest number of cases; children are not exempt from the disease, as careful perusal of the literature shows a few cases occurring during the earlier years of life. Clemens[2] reports four cases as occurring in children, Chapin[3] records other cases, as do also J. Lewis Smith[4] and Field,[5] six cases under the age of ten years. Whitehead[6] adds two children to the list. Laget[7] has observed an infant convalescing from diphtheria, who passed a mucous cast nearly eight inches long, and Barrier[8] an example of the disease in a child of five years.

[1] Pellicular colitis; intestinal cast; pseudo-membranous enteritis; intestinal desquamative catarrh; mucous disease; chronic muco-colitis; enterite interstitielle; chronic croup of the intestines; chronic pellicular inflammation of the intestinal mucous membrane; fibrinous diarrhœa; diarrhœa febrilis; follicular, duodenal, and colonic dyspepsia; chronic pseudo-membranous gastro-enteritis; tubular looseness, or diarrhœa tubularis; tubular exudation casts of the intestine; vegetations de la muqueuse de l'intestine gréle; mucous or gelatinous diarrhœa; hypochondriasis pituitosa (quoted by Field); mucous casts, and many others.

[2] Ueber dem Darmkrup der Kinder, Jahrb. für Kinderkrankheiten, 1860, Bd. xxxiv. S. 30.

[3] Arch. Pediatrics, 1884, vol. i. pp. 447–49.

[4] Fourth ed., p. 437.

[5] Fiske Fund Dissertation, No. xxxvii.

[6] Med. and Surg. Rept., Manchester Hosp., 1870.

[7] Bull. Soc. Anat., Paris, 1875, p. 843.

[8] Traité Pratique des Mal. de l'enf., t. ii. p. 36, 2d edit., 1845.

Sex.—Cases of membranous enteritis are generally seen in hysterical women, or hypochondriacal men, a fact well recognized by an early writer, who, as already stated, styled the disease, "hypochondriasis pituitosa." Whitehead tells us that out of one hundred cases only *four* occurred in males; Field notes eighty per cent. of the recorded cases as occurring among females.

When endeavoring to seek the active causative agent of this enteric condition, one is met with such a diversity of opinion as to be almost embarrassed by its richness. We will, however, most usually find the disease occurring apparently as a concomitant or sequela of either disease of the genital or intestinal tract, or of the nervous system. As illustrating the apparent connection between this condition and uterine disorders, we might cite the case reported by Hess,[1] where the patient had had two miscarriages preceding the attack of membranous enteritis, during which she passed pieces of membrane a foot long. Fish[2] observed a woman aged forty, in whom a uterine disorder had preceded the expulsion of the membranes, and F. W. Gross[3] a case in which a similar discharge from the vagina accompanied that from the bowel; all the cases seen by this observer were females, and at or about the middle period of life.

The apparent connection between irritation or disorders of the intestinal tract and the occurrence of membranous enteritis, is well shown by Willard's[4] case, which occurred in a previously healthy female, aged forty, who some six months before had been poisoned by excessive doses of podophyllin. Most all observers

[1] Med. and Surg. Reporter, 1880, p. 42. [2] Ibid., p. 417.
[3] Boston Med. and Surg. Journ., 1881, pp. 27–55.
[4] Trans. Path. Soc. Phila., 1876–77, vol. vii. p. 37.

report an antecedent dyspepsia and constipation, alternating with diarrhœa. Grantham, as early as 1849, considered the abuse of mercury as productive of the condition under consideration. Abdominal cancer, pyloric obstruction, proctitis, hemorrhoids, typhoid fever, disease of the prostate gland, and enteralgia, have all been considered as causative agents. Patients suffering from erysipelas have passed membranous casts. Muhlenberg[1] has observed the same occurrence in tuberculosis of the intestine.

We must exclude cases of the so-called croupous or diphtheritic enteritis, as it is not the province of the present paper to consider all forms of membranes passed, but simply that which is purely a mucous cast; hence but passing reference will be made to Boyd's[2] case, in which a deposition of membrane occurred all through the colon, especially in its transverse portion, where the adventitious membrane could with difficulty be separated from the bowel, and was quite flaky, it was evidently a croupous exudate: of a similar nature are the cases recorded by Powell and Bartholow, who considered the membrane passed as the process of a down-travelling diphtheritic focus. The specimens and photo-micrographs of the pseudo-membrane of dysentery recorded in Part II. of the *Medical History of the War of the Rebellion*, are also not accorded a place in the present paper. Lastly, to illustrate its association with disorders and disturbances of the nervous system, we have but to recall the fact that many of the cases present a history of hysterical outbreaks, neuralgia, sciatica,

[1] Amer. Journ. Med. Sci., 1878.

[2] Trans. Acad. Med. Ireland, Dublin, 1885, vol. iii. pp. 308–310.

and other nervous troubles; indeed, Da Costa would attribute the true etiology to the nerves presiding over nutrition and secretion, considering the disease as a manifestation of disordered nervous supply, which may be either general or local. Wales considered the ganglionic nerves of the intestine to be primarily at fault.

Symptoms.—In no way, perhaps, can a better understanding he had of the general clinical features of the disease under consideration than by recording the following cases from the writer's practice:

Case I.[1]—S. H., aged thirty-one years, a woman of good physique; weight 150 lbs. Married nine and a half years ago, first and only child born twenty-seven months before coming under the writer's observation. The labor was normal, and the recovery good. No miscarriage or uterine disorder; health has always been good, is neither nervous nor hysterical; no hereditary contamination. All organs apparently healthy. Three years ago, after a severe attack of dyspepsia, she passed an intestinal cast, which was quite fourteen inches in length.

Since the first appearance of the membrane the passage has been frequent, the total quantity would be quite two gallons. A peculiarity in the case, to which we will refer later, is that the patient complains of no colic, tenesmus, or tumefaction, and suffers no pain during or preceding its passage. Bowels constipated. The paroxysmal passage of the casts, marked at first, has given away to their almost constant presence. Blood never occurs in the discharges. The patient's general health is excellent, her periodical functions are performed with regularity and ease, she feels quite well, and were it not for the mental distress that her condition occasions, would consider herself in perfect health.

[1] This case has already been referred to in The Medical News, August 7, 1886, but a synopsis will now be given.

Case II.—E. P., aged seventy-one years, admitted to Dr. Osler's wards in the Philadelphia Hospital, to whose courtesy I am indebted for the privilege of publishing the case. The man was under observation for about six weeks, but was unconscious, and no history could be elicited.

Autopsy twenty-four hours after death.—A very complete and exhaustive examination was made, but, for our purpose, we will consider the intestinal condition alone. The man died of chronic nephritis and purulent basic meningitis.

Intestines.—Small: show distinct Peyer's glands without ulceration. Large: the ascending portion of the colon pre-

sents membranous casts and flakes, closely adherent, yellowish-white in color; small pieces of semi-translucent membrane and some solid roundish cords, which run into a clear colorless jelly, which is almost structureless, is handled only with the greatest difficulty, and when placed in water becomes hardly visible. The appearance is well illustrated by the accompanying photograph, which represents a segment of the colon with the membrane *in situ*.

The point of special interest for us in this case is, of course, the condition of the gut, which, excepting the presence of the membrane, was absolutely normal. No evidence of past or present colitis was to be noted, the small gut and stomach were in a similar healthy condition, and contained no membrane. Judging from the post-mortem evidence the man's digestion and assimilation were as good, if not better, than in most persons at his advanced period of life.

We were unable in any way to connect the existence of the membrane with the patient's condition just preceding death, and can but conclude that it was simply without clinical manifestation, except the passage of membrane in the stools.

The passage of the casts is usually paroxysmal, accompanied by abdominal pain, tenesmus, and nervous disturbances, and is preceded or followed by digestive troubles. Abdominal tenderness almost always exists, and is generally relieved by the passage of the membranes; blood may be present in the discharges;[1] at this time the bladder will usually present some symptoms, more particularly should the disease occur in a female, when manifestations of uterine disorders will be almost invariably present. Patients who are the subjects of membranous enteritis, while they do not lose the normal contour of the body, still present some evidences of malnutrition: they are apt to have eruptions of furuncles and carbuncles, sore mouth or herpes of the genitals, and an irritable nervous system.

Emaciation is rarely a marked symptom, it is indeed worth noting that this almost entire lack of emaciation

[1] Hutchinson: Trans. Lond. Path. Soc., vol. ix. p. 188, with Plate.

persists throughout the cases, notwithstanding the amount of matter passed.

The number of paroxysms and the duration of the attacks are very variable, and may be preceded by certain premonitory symptoms, as Da Costa has observed a patient who was able, with absolute certainty, to foretell an attack by a sense of chilliness, blueness of the nails, and tingling or pain at the finger-tips. Patients may suffer but one attack in a year, one a month, or, on the other hand, the paroxysms may be continuous, as in our first case; the duration of these attacks is also very irregular, they have been reported as short as twenty-four hours, and as long as two weeks; the difficulty in precisely limiting the attack will be appreciated when we remember that in the more chronic cases there is an almost constant sequence of symptoms; we must also bear in mind that the patients are usually dyspeptic, and suffer more or less from constipation and abdominal distress, which sometimes amounts to severe pain referred to the umbilical region;[1] indeed this train of symptoms usually precedes for some time the expulsion of the membranes.

Hess[2] has recorded an interesting case in which the patient appeared to know when the pieces became loose, as she could feel them moving their entire course through the intestinal canal.

Membranes are not found in each stool during a paroxysm, as a rule, but a single accumulation is generally passed accompanied by pain and tenesmus—indeed, some cases only discharge the membrane about

[1] New York Medical Record, 1882, ii. pp. 33–36.

[2] Med. and Surg. Reporter, 1880, p. 42.

once a week; on the other hand, patients may have ten or a dozen membranous stools in twenty-four hours.

Pain, tenderness, and tenesmus are complained of in varying degrees by different patients; the most usual manifestation is abdominal pain, which may be simply a sense of uneasiness or severe agonizing pain[1] which is generally relieved by the passage of the membrane; tenderness may exist over the entire abdomen or be localized and only developed by firm pressure.

Hemorrhoids, prolapse of the rectum, diarrhœa, jaundice, extreme thirst, coated, anæmic, and fissured tongue, aphthous ulcer of the mouth, and tonsillar phagedena have all been noted in the symptomatology of the disease.

The nervous system presents many and varied manifestations. To some of these neuroses we have already called attention, particularly the hysterical derangements, which are the most frequent of all the functional disturbances; this applies both to males and females affected by membranous enteritis. The following symptoms have been noted: neuralgia, hyperæsthesia, irregular muscular tremors, paresis, hysterical tetanus, coma, and convulsions. Transient defects in vision, tinnitus aurium, and disordered sense of taste are all among the recorded symptoms.

Whitehead notes chorea and paralysis in children, and Copeland has observed a cataleptic condition follow an hysterical outbreak.

Cerebral symptoms have occasionally appeared, for instance amnesic aphasia has been recorded; mental depression, faulty memory, hypochondriasis, and melan-

[1] Hutchinson: Ibid.

cholia may be exhibited for a time, to be followed possibly by increased mental activity.

The association of this disease with uterine disorders has already been noted, as has also the fact that a simultaneous discharge may take place from the bladder and the bowel; cystitis, strangury, and frequent micturition may cause bitter complaint. The urine does not present any alteration that can be associated with the disease under consideration. The temperature is rarely above normal, except possibly during the height of a paroxysm which is accompanied by much pain; it may, however, be affected by an intercurrent disease, as phthisis.

Macroscopic and microscopic characters of the membrane.—The gross appearances of these casts are well shown by the accompanying illustration. They are for the most part made up of opaque, white solid masses, rounded or flattened, and small flocculent pieces of semi-translucent membrane; the membranes are delicate and are handled only with the greatest difficulty, out of water.

Microscopically the membranes in our cases corresponded somewhat closely to those of Goodhart.[1] Under a two inch objective their surface was seen to be composed of opaque and translucent parts, the former apparent as rounded ridges marking off the latter into regularly arranged hexagonal or polygonal crypts. Under a higher power these crypts are still visible, although much less defined. These appearances are best seen in the small flakes of membrane, less distinctly

[1] James F. Goodhart: Trans. Path. Soc. Lond., 1872, xxii. p. 98, plates iii.

in the larger masses, and not at all in the finer networks[1] that are sometimes passed.

These masses appear to be due to the formation of mucous and epithelial matter either upon the surface of or in contact with some follicular mucous membrane. This view is further evidenced by the nomenclature of the Pathological Society of Philadelphia, which, for example, considers the membranes to be the product of an "interstitial desquamative catarrh." On comparison of these membranes which are moulded by the gut with the healthy mucous membrane, certain differences are at once apparent; the mouths of the pseudo-follicles on the surface of the cast are much larger than those in the normal intestine, they approach closer to each other and may run one into the other; the cells present in the membrane have no definite arrangement and are not placed upon a basement membrane, which is entirely absent in the mucous formations. The cells have undergone a fatty and disintegrating process.

Drs. Wilks and Andrew Clark, reporting upon the microscopic examination of Hutchinson's case to the London Pathological Society, make some interesting observations. Upon laying open the cast and examining its inner surface under forty diameters a gelatinous membrane-formed matrix was observed, traversed by a coarse network of opaque yellow lines, and studded at their points of intersection by similarly colored roundish masses; from the large network proceeded a smaller network and in its meshes were found at close and regular intervals, well-defined oval or round openings, with elevated margins, resembling in appearance the

[1] Case of Griffiths.

mouths of the follicles in the large bowel. Under 350 diameters the matrix was transparent, structureless, elastic, and everywhere free from fibrillation. Embedded in it were granules, free nuclei, cells, crystals, and particles of undigested food. The opaque yellow lines were seen to be composed of foreign matters, as bile-pigment, earthy and fatty granules, portions of husks of seeds, gritty tissue of pear, a peculiar form of elastic tissue, stellate vegetable hairs, and a mucedinous fungus.

The cells in the matrix were either spherical or cylindrical, in some portions lying without obvious order, in other parts they were arranged in layers. Generally the membranes have consisted of a single layer of matrix with cells, but in some places several layers of matrix could be noted.

Dr. Andrew Clark, in a supplementary note, takes exception to the above report. After citing several propositions to prove his hypothesis, he concludes that he is justified in stating that the casts or membranes are not fibrinous, that they are not the product of inflammation in the sense defined (chronic inflammatory action of the mucous membrane and subsequent exudation), and that the abnormal cell products have arisen in some other way—*i. e.*, metamorphosis—than by free development of an exuded blastema. He also makes this further observation, which is of extreme interest in the present study—the product of diseased action in mucous membranes occurs in three varieties: first, a clear, jelly-like, and imperfectly membranous substance; second, yellowish, semi-opaque, flaky, and usually membranous; third, yellowish-white, dense, opaque, dis-

tinctly membranous, tough, and rather adherent to the subjacent surface.

Action with reagents.—H. B. Hare states that pharyngeal mucus, for example, will exhibit chemical reactions similar to those of the membranous discharges, and states further that the discharges consist essentially of mucin, with possibly a trace of albumen and no fibrin, thus expressing our own views on the subject, and agreeing, for the most part, with all other observers.

Strong acids and alkaline solutions of moderate strength will dissolve the casts. Their albuminous nature is shown by acting on these solutions with the usual tests for albumen—heat and nitric or acetic acid. Some observers (Clark) have noted the absence of albumen in the membranes. According to Goodhart, after the solution has been precipitated it cannot be reprecipitated by acetic acid, ferrocyanide of potassium, alcohol, ether, or perchloride of mercury. The casts stain readily but irregularly with carmine.

Pathology.—As we have before stated, it is not within the province of this communication to consider the membranes which are the product of croupous or diphtheritic inflammation, but rather, as Field defines it, a "non-febrile disease of the intestines, characterized by irregularly recurring paroxysms of abdominal pain, which is relieved by the discharge of the membranous shreds or tubes composed chiefly of mucin."

Da Costa is of the opinion that the affection is not originally an inflammation, but considers the inflammatory element as the result rather than the cause. This observer would attribute the true etiology to the nerves presiding over nutrition, considering the disease as a manifestation of disordered nervous supply, which

may be either general or local. Clark held that the membranes were not the product of inflammatory action because they contained no fibrin, a view not tenable at the present day, because we know that fibrin is not an essential component of an exudate. Our own views are in accord with the general consensus of opinion that if inflammation is present at all it is in a very mild form. Siredey, Wales, and Whitehead all practically agree that the pathogenesis of the affection is to be looked for in the nervous system; indeed, as Da Costa most aptly remarks, "The association often with similar discharges from other outlets, points to a deeper, more general cause than enteritis, or morbid condition of the intestinal mucous follicles."

The colon seems to be generally the selective site of the disease; this, however, is not always the case, as the small intestine may be invaded, either in conjunction with the colonic deposit or entirely independent of it. Young adult females, or those in the middle period of life, seem to offer, as far as age and sex are concerned, the most favorable subjects.

Upon referring to the literature of the subject one is at once struck with the extreme paucity of post-mortem records of the disease, and, if we exclude all cases of croupous or diphtheritic deposit, the number becomes small indeed.

Simpson says that Abercrombie saw a case in which the mucous membrane of the colon was covered by an immense number of clear white spots, which were small vesicles, that, when punctured, discharged a small quantity of clear fluid; the patient during life had passed a large quantity of membranous casts or

tubes. The small intestine was healthy. The girl died of phthisis.

Wright's case presented the mucous membrane of the colon and lower portion of the small intestine studded with a thickly set papular eruption. Barrier (ibid.) noted alteration in the follicular apparatus of the intestine, and Laboulbène[1] states that the membranous discharge first makes its appearance in the summits of the intestinal folds, and there spreads, being slightly adherent to the mucous membrane.

In view of the meagre post-mortem literature of the subject how interesting do the records of our cases become. Here the membranous deposit was confined to the colon entirely, and was extremely adherent to the gut, giving place to a colorless, structureless jelly, which was handled only with the greatest difficulty.

Diagnosis.—The diagnosis of this condition presents but few, if any, difficulties. If mistakes arise they are, in all probability, due more to the carelessness of the observer than to any obscurity in the manifestations of the usual clinical phenomena of the disease. In the writer's experience the membranes have been considered to be ascaris lumbricoides, the resemblance, in some cases, was close indeed, but readily distinguished by the most casual examination; again, the white, shining, detached pieces have been mistaken for segments of the tænia mediocanellata, tænia solium, and the bothriocephalus latus; but, as above stated, the failure correctly to recognize the nature of the case is not on account of its atypical manifestation. It has also been

[1] Recherches sur les affections pseudo-membraneuses, p. 516, Paris, 1851, quoted by Field.

mistaken for fatty discharges, and the lionteric discharges of dysentery. Anal fissure may cause a hypersecretion of mucus.

In cholera a fibrinous or gelatinous matter has been noticed in the small intestine; in occasional cases this has taken the form of a croupous deposit. In puerperal fever, scarlatina, pyæmia, and in tubercular disease a membrane occasionally forms and is cast off. That patients may inadvertently be misled, and thus mislead their medical adviser in relating the history of their complaint, is proven by the experience of Queckett, quoted by Richard Quain, who records the case of a woman, who, at intervals of two or three weeks, had severe abdominal pain, occurring in paroxysms, always relieved by the passage of a mass, sometimes as large or larger than an orange, made up of membranous matters and tubes. The mass represented the undigested portion of mutton chops upon which the patient had been living.

Queckett further states that he has observed nine cases of a similar character. Schubler[1] gives a plate illustrating peculiar branching tubes passed per rectum, which were also probably the arteries and ligaments derived from the meat diet of the patient; similar cases are reported by Elsaesser and Uhl. In other cases the membranes appear to be made up entirely of yellow elastic tissue, which, according to Corrigan,[2] resembles closely the ligamentum nuchæ of sheep.

In conclusion, portions of the gut itself,[3] or of its

[1] Jahrbücher d. deutschen Med. v. Chir., Bd. iii., Heft i. S. 65, Nürnberg, 1813.

[2] Dublin Hospital Gazette, 1854–55, vol. i. p. 38.

[3] Ziemssen's Cyclop., Boehm, vol. i. p. 332.

necrosed mucous membrane, may be voided by stool, but the history of the case, the constitutional condition of the patient, together with the concomitants and the appearance of the matter passed, should quickly elucidate the nature of the disease.

Prognosis.—The prognosis, in relation to cure, is essentially bad; most cases run a prolonged and tedious course, in many extending over the largest part of their adult life; as, for example, the patient of Gross, in whom the disease lasted nineteen years, and Da Costa's case of twenty years' duration; on the other hand, the disease, of itself uncomplicated, rarely proves fatal, the recorded causes of death are totally independent of the membranous affection.

Treatment.—We may consider the treatment under two headings: the prophylactic and the active, or that which is appropriate during an interval or remission, and that which we will resort to during an exacerbation.

It is during the remissions or intermissions that we can hope to do more for our patient's permanent good than during an actual attack; it is at this time that diet, regimen, and hygiene are indeed the sheet-anchors. A careful supervision must be had of the patient's daily life, all sources of irritation are to be removed, as hemorrhoids or uterine disease. Easily digested or even pre-digested food should be supplied, and care should be taken that undigested particles of food are not irritating the intestinal canal. As constipation usually exists, sometimes to a most stubborn degree, mild saline laxatives are usually most efficacious, or enemata may be resorted to.

Exercise for those who can stand it is of paramount importance; this, if possible, should be out of doors.

Dr. Fowler most aptly says, he who stints himself in the drinking of water is dirty inside, and he also tells us that we must drink between seventy and seventy-five ounces of water per day in order to make up for the amount which is excreted by the lungs, skin, and kidneys, amounting to ninety ounces a day; with the solid food we get about fifteen ounces. Very few persons at home drink as much as that, but should they go to any of the numerous springs in which our country is so peculiarly rich, drink five pints of water per day, lead a regular outdoor existence, breathe pure air, as many of our springs are situated in most beautiful mountain regions, where the life spent out of doors is most beneficial, the patient will be improved in health, independently of any mineral agent whatever in the water. Unfortunately, however, all of our cases will be unable to avail themselves of a course of treatment at the springs, but as there is no doubt that most of the natural mineral waters preserve their value for a long time, we can put patients through a thorough course at their own homes with the additional advantage of having the case under our own supervision.

During the acuteness of an attack opium will often be found necessary to afford relief, and possibly to check excessive secretion or hemorrhage. Belladonna in the form of the extract, Dover's powder, subnitrate and subcarbonate of bismuth, together with local counter-irritation, all tend to abort the paroxysm, or, at least, to shorten its duration. The following remedies have been suggested: arsenic, copaiba, bromide of potassium, nitromuriatic acid, henbane, vegetable infusions, prolonged counter-irritation, electricity, turpentine, iron, cod-liver oil, oxide or nitrate of silver by mouth or by

high injections, chloride of ammonium, sulphate of zinc, bichloride of mercury, chlorate of potassium, oxide of zinc, blisters, warm water enemata, nux vomica, ergot.

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References marked with an asterisk are taken from Field's Prize Essay on Membranous Enteritis, 1887. I have omitted all references that are to be found in the Medical and Surgical History of the War of the Rebellion, Part ii., Med. Vol., pp. 363 to 368, as the publication is so generally accessible that those specially interested can consult it in the original.

Specimens of the membranes are preserved in several museums, to which I have referred in an earlier communication (Med. News, Aug. 7, 1886).

[After the reading of the preceding paper :]

Dr. Edward T. Bruen said : I desire to state that I have at the present time a case of this disease under treatment. This is a nervous hypochondriacal patient who was sent to me by Dr. Harrison Allen on account of nervous dyspepsia. Shortly after coming under my care he called attention to the fact that he was passing a large quantity of matter from the bowels, and he thought that he was passing portions of the intestine. This was first discovered in August, and since then he has passed each week a large quantity of this material. The general health has not seemed especially affected by the discharge of this material, and there are not many symptoms referable to the bowel. There is no diarrhœa, but rather constipation. The chief symptoms are those of neurasthenia with palpitation and general abdominal distress. I had intended to report this case at some other time, when I should have made up my mind as to the way in which it was going to terminate, but Dr. Edwards's interesting paper has led me to make this statement at the present time.

Dr. William Osler said : This is a subject in which I have taken considerable interest. I have had a large number of these specimens sent to me, and for many years I have made it an invariable rule in making post-mortems to slit open the colon and examine it. In this way this condition will frequently be found in cases that have presented no symptoms during life. I am sure that I have seen five or six cases in which the colon presented considerable quantities of this mucus, sometimes arranged in the form of membrane, and at other times in curious cord-like forms.

The cases which I have had the opportunity of studying clinically have presented the features which Dr. Edwards and other writers have indicated. The affection occurs almost entirely in hysterical or very nervous females. So far as I know, the affection is incurable, but I would suggest that possibly the

use of voluminous injections of nitrate of silver might prove beneficial for we know the value of this plan of treatment in chronic dysentery. In this disease, which is essentially a catarrh of the colon, I think, never extending into the small intestine, it is possible that good might follow.

Dr. James C. Wilson said: Dr. John B. Field, in commenting on the occurrence of pseudo-membranous enteritis, called attention to the fact that it is much more common than is generally supposed. He thinks it probable that many cases escape observation from the failure of the physician to inspect properly the stools.

I rise to narrate briefly, in illustration of this statement, the following circumstance: A patient now under my observation, a somewhat hysterical woman, by profession a nurse, had been out of health for two years. The symptoms were chiefly those of dyspepsia with nervous manifestations. She was sent to Germantown to take charge of a case of membranous enteritis, and from the similarity of the symptoms of the patient with her own, and particularly from the occasional attacks of abdominal distress relieved by large movements from the bowels, she was led to inspect her own discharges and found this membraniform mucous material. I allude to this case as illustrating the fact that many people may suffer from this affection without being aware of it.

Dr. H. C. Wood said: I think that this is quite a common disease, but I do not agree with the statement that it is incurable. I have from time to time seen patients who passed immense masses from the bowels. In one case, that of a personal relative, the disease was apparently cured, and the individual died twenty years later of some other affection. I am reminded by Dr. Dercum of a severe case which I saw in consultation with him. In this case the woman was much reduced, and dissolution was distinctly threatened. Here we commenced with large injections of a solution of nitrate of silver, one drachm to the ounce. This was beneficial for a time. We

then substituted sulphate of zinc, and later used a dilute solution of nitric acid, five drops to the ounce. This was used in almost unlimited quantities. Under this treatment the woman apparently recovered, and has remained well for the past two years.

Dr. J. Madison Taylor said: With reference to prognosis, I would say that I have had several cases which recovered. One was that of a woman aged sixty-seven years. She had been failing for four or five weeks, and it was thought that there might be cancer of the stomach. On careful examination, it was found that she discharged these casts, some of them two and a half feet long. Under the use of a pill of nitrate of silver and opium with careful attention to diet she became perfectly well. That was eighteen months ago. She, however, occasionally passes these casts. I have had two other cases which got perfectly well. They passed casts some twelve or thirteen inches long.

Dr. De Forest Willard said: The report of my case, to which reference has been made by Dr. Edwards, was, I think, made early in the case. In its later history the symptoms were severe. The inflammatory symptoms were marked. We speak of patients with vesical calculi having a "fit of the stone." In this case there was always a "fit of the membrane." This would be preceded by high fever and intense pain in the abdomen. This pain was like that experienced when a membrane is torn from the throat or the skin is removed from a blister. She was conscious of the movement of the membrane through the whole intestinal tract. These attacks were preceded by constipation, and when the membrane started there was no relief except from the use of large injections of mucilaginous fluids. Injections of nitrate of silver, even when weak, gave great pain. The mucilaginous injections would bring away sometimes as much as half a pint to a pint of this membrane, which was sometimes tubular and sometimes flat. The pain was so severe that morphia in large

doses was often required. The exhaustion resulting from these attacks was so great that she was compelled to remain in bed for several days.

Since then I have met with two cases. The first case was not benefited by any treatment, but there would be long periods during which the patient would be better. If there was anything that seemed to lengthen these remissions, it was arsenic in small doses, long continued. I think that I should be inclined to try in such a case a prolonged course of bichloride of mercury in small doses.

Dr. John M. Keating said: We are in danger of making an error in diagnosis in confounding the passage of membranes and of casts. I have now under observation a case of stricture of the bowel in which Dr. Packard performed colotomy not long ago. This patient passes casts and shreds of membrane. The case is one of very tight stricture, and accumulation of mucus takes place above it. This forms casts which come away when injections are employed, and if care were not taken might be mistaken for membranes. I should think that microscopical examination would always be necessary to determine the position from which these masses come and to determine whether or not they are simply inspissated mucus.

Dr. Richard A. Cleemann said: I am glad that Dr. Keating has mentioned his case. I was about to refer to a case of pelvic peritonitis of gonorrhœal origin, in which large masses of mucus were passed. This patient entirely recovered, and the symptoms of peritonitis disappeared. My theory was that there was a contraction of the bowel as a result of the peritonitis, and that the mucus collected behind this obstruction. As we know, a large proportion of the cases of membranous enteritis occur in women, and it may be that these cases may be due to this cause.

Dr. Wharton Sinkler said: Most of the cases of this affection which I have seen, have been in women who were the

subjects of hysteria. In the cases reported to-night, I notice that the patients have been either hysterical or hypochondriacal

The President said: I recall the case of a lady who had an attack every three months, which ended in hystero-epilepsy, during which she usually passed a cast. She continued in this condition for some years, and then became insane.

Dr. Edwards said: I have little to say in conclusion. I do not think that these cases are curable, and I believe that if Dr. Taylor will observe his case for a longer period that there will be a return of the trouble. My endeavor was to present cases of membranous enteritis in which membrane was discharged without any special clinical symptoms. I have not found a case of this kind which has not occurred in a hysterical woman or in a hypochondriacal man.

The injection of a solution of nitrate of silver high into the bowel was recommended by Dr. Da Costa, but was used without success. I have tried it, and others have also employed it, without benefit. It seems to me that, independent of any form of treatment, the disease will remit for from two to five years.

In the cases referred to by Dr. Keating and Dr. Cleemann, there is a definite series of symptoms attendant upon the disease.

REPORT

OF A

CASE OF WLADIMIROFF-MIKULICZ OSTEOPLASTIC RESECTION OF THE FOOT.

By

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[Read November 2, 1887.]

The operation which is the subject of this report was originally designed by a Russian, Dr. W. D. Wladimiroff, in 1871, but as he published the account of it in his own language, it was not known out of Russia until nine years afterward. In 1880 Dr. John Mikulicz, of Vienna, performed the same operation and published it as his own device, not knowing that it had ever been done before.

Wladimiroff called it the operation for the production of artificial pes equinus; Mikulicz, the osteoplastic resection of the foot. The toe-stump operation would probably still better distinguish it. It consists essentially in removing the entire heel and ankle-joint and applying what remains of the foot to the leg in a position of pes equinus (Fig. 1), so that the patient walks on his

toes. The conditions for which it has been performed are (1) caries of the larger tarsal bones, and (2) extensive loss of the tissues about the heel, either from disease or injury. For the relief of the former it has been almost exclusively practised, and a number of excellent results have been obtained, though there is, of course, the risk of the disease attacking the remaining

FIG. 1.

Artificial pes equinus.

bones and causing relapse. To the latter class of cases, though of these there are as yet but few examples, it will probably prove more particularly applicable, as in them the tissues involved preclude the conservative operations of Chopart, Pirogoff, and Syme, and leave no alternative but amputation of the leg. Should further experience confirm the observations so far made, that this operation is followed by decidedly better functional results than amputation, its future scope will probably include many cases of railroad, gunshot, and the like injuries, where the parts destroyed correspond with those which by it are removed.

There have been twenty-one cases recorded within the past seven years. Most of these have been suc-

cessful, and most of them for caries. The case reported this evening is only the second in which the operation has been done for injury of the tissues about the heel. The patient's history is as follows:

Wm. D., aged thirty-seven, born in Scotland, a strong, healthy man, was admitted to the Episcopal Hospital, November 16, 1886. Two months before his admission he had been run over by a freight car. The wheel had passed over his left foot, tearing away the tissues of the heel down to the bone, laying bare the extensor tendons of the toes, and leaving an isthmus of sound integument upon the dorsum of the foot not wider, according to the patient's recollection, than an inch and a half. During his stay in the hospital of nearly four months, the ulcer, for which he was admitted, obstinately refused to heal. Its cicatricial border having advanced to the utmost limit of its tensile strength, would repeatedly break down, so that all efforts to facilitate healing failed. The accompanying cut (Fig. 2), taken from a photograph of the foot at the

FIG. 2.

Traumatic ulcer of the heel.

time of the operation, shows accurately the position of the ulcer and cicatrix on the outer side. On the inner side the

ulcer did not extend quite so far forward. The operation was performed with proper antiseptic precautions, March 8, 1887.

The patient, after etherization, was placed upon his abdomen; the sound leg was flexed upon the thigh and held out of the way by an assistant. The injured foot having been cleansed, was elevated upon a block placed beneath the rubber cloth and a constant stream of sublimate solution from the irrigator directed upon it during the two hours and three-quarters occupied by the operation.

The first step consisted in dissecting out the posterior tibial nerve. An incision started behind the inner malleolus was carried obliquely downward and forward below it to a point below Chopart's joint. The nerve was found to be so deeply imbedded in newly formed, very dense fibrous tissue, that it was dissected out with some difficulty. It was then divided at the upper and lower angles of the wound, about two inches of its length being removed.

The second step in the operation consisted in forming the flaps. These had to be slightly modified by the form of the ulcer, in order that their edges should consist of moderately healthy skin; in most respects, however, the limits of the ulcer corresponded with rather remarkable accuracy to the prescribed lines of incision. The first incision was carried across the sole of the foot, down to the bone, from the tubercle of the scaphoid on the inside to a point a finger's breadth behind the base of the fifth metatarsal bone on the outside; and the second straight across the back of the ankle half an inch above the os calcis, from the external angle of the sole incision to the upper angle of the tibial nerve incision.

The third step consisted in the resection of the astragalus and os calcis, and the shaving off of the lower ends of the tibia and fibula and posterior surfaces of the scaphoid and cuboid. Disarticulation of the astragalus at the ankle-joint was done from behind forward; of the os calcis at its cuboid joint, and the astragalus at its scaphoid joint from below upward. Due care was taken not to injure the dorsalis pedis during the last-mentioned disarticulation, as the position of

the ulcer necessitated the division and ligation of the posterior tibial artery in forming the flaps.

The last step in the operation included the approximation of the bones, divided nerve and tendon ends, and the closure and dressing of the wound.

With the view of obtaining more perfect fixation of the tarsus to the tibia and fibula than has heretofore been found possible, two sterilized bone dowels were placed in holes drilled into the lower extremity of the tibia at points which corresponded as nearly as possible to the centres of the presenting surfaces of the scaphoid and cuboid; the insertion of their projecting points into these bones being deferred until the final adjustment of the parts. A very fine catgut suture was so placed in the divided and retrenched ends of the posterior tibial nerve as to bring these ends into very accurate apposition without undue pressure. The slack, however, was not yet taken up. In like manner sutures of stronger gut were introduced into the divided and retrenched ends of the tendon of the peroneus longus, about three inches of which were excised, and into the divided end of the tendo-Achillis, and the edge of the plantar fascia exposed in the lower flap. These sutures were all allowed to remain slack until the foot should be brought into its new position. Moderate pressure was sufficient to accomplish this and to impale the tarsal bones upon the sharp-pointed dowels. With the foot firmly retained in this position, the extremities of the nerve were brought accurately together and sutured. The tendon of the peroneus longus was likewise sutured and the terminal extremity of the tendo-Achillis stitched to the edge of the plantar fascia. The introduction of drainage catgut and suturing the skin flaps with catgut completed the approximation of the parts. A dressing of gauze, iodoform, and sublimate cotton was applied and the limb was placed upon a straight posterior splint. The latter was in three days substituted by a plaster-of-Paris double dressing, the foot and leg sections being connected by an iron bracket anteriorly in order to leave ample room for washing and dressing the wound. Five weeks later a small ulcer

remained, but union of the deeper parts was complete and consolidation of the tarsal and leg bones was found to have begun. The patient at this time complained of tingling in the toes accompanied by occasional shooting pains, and there was partial anæsthesia of the sole of the foot. Sensation gradually returned, and is now restored except over a very limited area.

Three months after the operation, under ether, the toes were extended to a right angle; to accomplish which moderate force only was required. Since then there has been nothing to note. The limb continues to gain in strength and the patient can

FIG. 3.

Appearance of the foot after the operation.

now, with a cane, walk four miles a day. He has had the braced shoe which he wears but two weeks, and has, therefore, not yet had time to become thoroughly accustomed to it. He walks well without a cane, while with one, when not fatigued, he shows hardly a limp. This cut (Fig. 3) represents the limb after the operation, and was engraved from a photograph on the block.

Two modifications of the operation, as practised in this case, deserve mention, namely: the employment of

bone pegs or dowels to fix the tarsal bones to the tibia, and the suturing of the divided and retrenched tendons. The dowels provided proved rather too light to make the joint firm and immovable, but they were nevertheless used, as heavier ones were not at hand. Perfect fixation of the tarsus and leg at the outset, by lessening suppuration, by promoting early bony union, and by obviating the necessity of such carefully applied outside support, would seem to be an important factor in the after-treatment of the operation. The dowels should be three-sixteenths of an inch in diameter and three inches in length. They may be sunk two inches in the tibia and one inch in the tarsus. Holes need not be drilled for them in the latter, as their sharp points readily penetrate the cancellated structure of these bones. Uniting the severed tendons has, without doubt, added to the function of the foot in this case. Though suggested in *The Medical News* editorially, it does not appear to have been attempted before. The plantar fascia was chosen as a strong accessible point to which to attach the tendo-Achillis, instead of the tarsal periosteum, as suggested in *The Medical News*.

Within the narrow limits of motion which now remain, the patient can flex, as well as extend the foot. The motion is partly tarso-metatarsal, and partly tarso-tibial. The latter is diminishing, and the braced boot which he wears may probably be cast aside within one year.

The following table includes, it is believed, all the operations which have been performed, with the exception of five Russian cases reported incidentally by Sklifossowsky. The first nineteen cases are taken from the table of Zesas, *Archiv für klinische Chirurgie*, 1886, Bd. 33.

No.	Operator.	Year.	Age.	Cause.	Result.	Authority.	Remarks.
1	Wladimiroff,	1871	15	Caries.	Recovery.	Aus den Arbeiten der Gesellschaft der Aerzte der Stadt Kasan, 1872.	Patient walked very well without cane.
2	Mikulicz,	1880	23	Syphilitic ulcer.	Recovery.	Archiv für klin. Chirurgie, Bd. 26.	At the end of four months patient walked with cane and boot, while in eighteen months did hard work, and could walk one hour.
3	Socin,	1881	22	Caries.	Recovery.	Jahresbericht über die chirurgische Abtheilung das Spitales zu Basel, 1881–82	After two months used cane and worked in the field; no relapse after two years.
4	Mikulicz,	1881	27	Caries.	Recovery.	Centralblatt für Chirurgie, 1884.	Patient, with boot, could walk quite far, but without it had to use a cane; six months afterward died of pulmonary tuberculosis.
5	Sklifossowsky,	1882	30	Caries.	Recovery.	Bull. de la Société de Chirurgie de Moskou, 1882.	Patient did well.
6	Haberern,	1882	18	Caries.	Relapse.	Verhandl. der Deutschen Gesellschaft für Chirurgie, 1884.	Amputation of the leg, after five months, from which he recovered.
7	Mikulicz,	1883	16	Caries.	Recovery.	Centralblatt für Chirurgie, 1884.	Patient walked in six months with boot; without it had to use a cane,
8	Lauenstein,	1883	32	Caries.	Recovery.	Ibid.	Patient died in eight months of what appeared to be pulmonary tuberculosis
9	Lauenstein,	1883	25	Caries.	Recovery.	Ibid.	Patient could walk four hours at a time, and without boot could step firmly upon his foot.
10	Mikulicz,	1883	?	Caries.	Recovery.	Verhandl. der Deutschen Gesellschaft für Chirurgie, 1884.	Patient walked well with cane.
11	Roser,	?	?	Caries.	Recovery.	Fischer: Deutsche Zeitschrift für Chirurgie, xxiii. S. 164.	Functional result excellent.

No.	Operator.	Year.	Age.	Cause.	Result.	Authority.	Remarks.
12	Kümmell,	1884	38	Caries.	Relapse.	Centralblatt für Chirurgie, 1885.	After four months resection of the rest of the tarsus, part of the metatarsus, and a portion of the tibia and fibula.
13	Schattauer,	?	10	Caries.	Recovery.	Ibid.	Patient, with boot, could walk many hours without fatigue.
14	Renssen, (Ranke's Clinic.)	1884	?	Deformity resulting from fracture.	Recovery.	Ibid.	Seven and a half months after operation patient walked well with boot; 3½ cm. shortening.
15	Schattauer,	1884	9	Caries.	Relapse.	Ibid.	Five weeks after the operation amputation of the leg; recovered.
16	Fischer,	1884	18	Caries.	Relapse.	Deutsche Zeitschrift für Chirurgie, xxiii. 1 u. 2 Heft.	Resection of second and third cuneiform bones and remainder of cuboid; recovered. At the end of a year patient walked well with boot and cane; could go up stairs.
17	Niehans,	?	50	Injury of heel.	Recovery.	.....	Very good functional result. Without boot or cane became easily fatigued.
18	Srodina,	1885	20	Caries.	Gangrene.	Centralblatt für Chirurgie, 1886, No. 3.	Amputation at the lower third of the leg.
19	Sordina,	1885	11	Caries.	Recovery.	Ibid.	Very good result.
20	Gutsch,	1886	13	Caries.	Recovery.	Archiv für klin. Chirurgie, Bd. 34, 1886.	Resection included parts of all the cuneiform bones and seven centimetres of the tibia and fibula; function completely restored.
21	Fenger,	1886	29	Caries.	Recovery.	Journal of the Amer. Med. Association vol. viii., Jan. 1887.	Fifteen months after the operation can walk without boot and cane, and bear the whole weight on the foot; solid ankylosis; lengthening 5 cm.
22	Hopkins,	1887	37	Traumatic ulcer.	Recovery.	.....	After eight months can walk four miles with cane and boot; limited motion under voluntary control in flexion as well as extension; about ¾ in. lengthening.

[After the reading of the preceding paper:]

Dr. De Forest Willard said: The risks of this operation, its tedious nature, and the prolonged recovery extending over months, would necessitate for its general use that the results should be better than are obtained in an amputation near the ankle-joint where, under antiseptic precautions, recovery occurs in a few weeks.

Dr. John B. Roberts said: It seems to me that the result obtained by this operation has been an exceedingly good one, and is only equalled by the ingenuity which Dr. Hopkins has displayed in perfecting this operation, which is to some extent new to surgeons.

AN UNUSUAL CASE

OF

CILIARY NEURALGIA WITH AN ERRATIC HISTORY; A CLINICAL STUDY.

By

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[Read November 2, 1887.]

Agnes L., a widow, aged fifty-seven, born in Ireland, was admitted to the Philadelphia Hospital, August 21, 1880, complaining of pain in a scar situated upon the ninth rib in the mammary line. It occurred at varying intervals, sometimes being absent for several days, but usually returning every second day.

History.—The patient's father died at the age of sixty-two from meningitis following a sunstroke. She was an only child, her mother having perished when she was born. As a child she suffered from the ordinary exanthemata and, when a young girl, had an attack of typhoid fever. At the age of sixteen she was married and in her eighteenth year was delivered of her first child. She subsequently gave birth to five other

children, the last when she was thirty-six years of age. In 1861, or six months after the birth of her last baby, her husband and eldest child died suddenly of smallpox. The receipt of this news, which was rudely communicated to her, produced an illness which began with unconsciousness and continued in various periods of delirium and hallucinations. At the end of several weeks the mental equilibrium was restored and convalescence progressed to perfect recovery. The attending physician told her that her sickness had been an attack of "brain fever."

Through her entire married life her health had been exceptionally good, and there were no indications of uterine disease or history of syphilitic infection. In 1868 she had a fall and struck her left side against a projecting stone, producing a severe contusion. This subsided with the exception of one spot, then about the size of a pea, which, she says, "looked like a blood-blister." This spot became elevated and gradually enlarged, while its color faded. In three years it had reached a sufficiently large size to cause considerable annoyance and was, moreover, the seat of irregular, dragging pains, easily allayed by the application of hot fomentations. In 1871 the tumor was removed, but its exact nature is unknown. For several years subsequently she enjoyed good health, was able to work regularly and support her family. At the end of this time she had a severe attack of intermittent fever lasting six weeks. For one month after recovery from this illness her health appeared to be in its usual state.

In July, 1880, she began to have pain in the cicatrix which resulted from the removal of the tumor. This pain differed from anything she had previously experienced. It was intense, lancinating in character, and came upon alternate days at about ten o'clock in the morning. During each pain-period the scar flushed and took on an angry look. When the pain subsided the color faded. No remedial agency, except a hypodermatic injection of morphia, gave relief. She endured this state of affairs for six weeks and then sought relief in the Philadelphia Hospital, where she was admitted August 21,

1880. She first entered the surgical wards, but after a month of fruitless treatment was transferred, September 21st, to the nervous wards. For several weeks internal remedies were tried in vain, when, by Dr. H. C. Wood's order, the painful cicatrix was removed. For six weeks there was an absolute cessation of pain, when, quite as suddenly as at its original onset, the pain returned with redoubled severity in the old situation. The attacks now usually occurred twice a day, at about ten in the morning and six in the evening, and were accompanied by the flushing of the tissues before described. No especial change, except quite temporary periods of relief, in the patient's state took place until the spring of 1881. Then, by the advice of Drs. Wood and Mills, under whose care she had been, active counter-irritation was performed. Dr. Pancoast made several pronounced applications of the actual cautery, over the posterior roots of the spinal nerves in the lower dorsal region. From the time of this application, for several months (probably two) she was entirely relieved of her sufferings. So radical did the cure appear to be that she was in the act of leaving the hospital when she was seized with pain in the left eye. As before, the pain was intense, lancinating in character, as if a sharp instrument was being thrust rapidly through and through the eyeball. The lids became congested and swollen, the conjunctiva reddened, the lachrymal secretion increased. For some time numerous and various remedies were tried without any but the most temporary results.

She was then transferred, May 20, 1882, to the eye ward, and became Dr. Shakespeare's patient. The pains were frequent, sometimes they occurred daily, sometimes twice a day, but occasionally were absent for a week, never, however, longer than for two weeks. A thorough and systematic anti-malarial treatment was ordered, even in so far as to use a decoction of lemon after the manner of Tommasi-Crudeli. As each successive remedy was tried the result and experience of the past were repeated. Temporary relief would be obtained, then the effect of the remedy would fail and finally the pains would

recur. A careful examination now revealed the following interesting facts. Preceding and during a pain-period marked tenderness over the middle cervical sympathetic ganglion of the same side was manifest. Moreover, pressure upon the eye produced pain in the region of the ganglion, and, *vice versâ*, pressure upon the ganglion caused pain in the eyeball. A similar tender area was found along the spine, directly between the shoulder-blades. This led to a return of counter-irritation as a means of treatment. Beginning with iodine and ending with the actual cautery, a succession of these agents was employed posteriorly on the left side of the neck and over the spine between the scapulæ. The actual cautery proved most efficacious and for several months the patient was free from her distressing affliction.

For the second time this unfortunate woman believed herself finally rid of her enemy and was in the act of gathering together her effects preparatory to leaving the hospital, when the pain recurred with all its former severity and attended with all its former symptoms. A seton was now introduced into the tissues at the back of the neck, and for a time, as with everything else, relief was experienced, hope returned, only to be displaced by a recurrence of the pain.

Examination of the interior of the eye never revealed any unusual features, as is evidenced by the following description: Round nerve, regular in outline, border distinct. Fundus not noteworthy beyond a peculiar curve of the lower vein. Inasmuch as the pain-periods were accompanied with great swelling of the conjunctiva the nutrition of the cornea was gradually impaired and a form of keratitis developed. This appeared as a curious opacity in the inferior half of the cornea, about midway between the centre and the lower limbus. This opacity, viewed by the ophthalmoscope, appeared to have dark processes like roots radiating from its upper edge. There was no connection between this and the iris or the anterior chamber. The pupil was normal, the anterior chamber of natural depth. There was never any increase of tension, and the field presented no distinct limitations.

In spite of a return to former lines of treatment and trials with all manner of general and special tonics, alteratives, and anti-rheumatic remedies, the pain continued and came with distressing frequency and severity. The keratitis increased, useful sight was obliterated, and the patient begged that the offending eye be removed. Although warned that the removal would in all probability only occasion a shifting of the seat of the affection, she was persistent in her entreaties, and her request was finally acceded to. In exactly three weeks after the enucleation was performed the pain appeared in the right eye in character precisely similar to that which had formerly had its seat in the left one, and accompanied by tenderness of the middle cervical sympathetic ganglion of the right side, just exactly as it had previously been present upon the left side.

Examination of the eye revealed the following features: Iris moved sluggishly to changes of light and shade. Mean size of pupil one-third the size of the cornea. Iris normal in appearance. Media clear. Outline of the optic nerve regularly oval, its long axes 75°. The color of papilla slightly brick-dust. The outer half somewhat paler than the inner, and the corresponding scleral ring more distinct. The vessels were normal in their course, the arteries probably a little lessened in their calibre. There was slight narrowing of the visual field on the nasal side and above and below. Tension of the eye normal.

To detail the symptoms and course of this case from this period up to the present year would simply be to repeat what has already been described, with the exception of one symptom, viz., the marked tenderness over the middle cervical sympathetic ganglion. This symptom was no longer a characteristic one in June of this year, when Dr. de Schweinitz took charge of the wards. Exactly when this curious tenderness began to subside cannot be definitely stated. Even now, during a pain-period, it is perfectly easy to demonstrate an area of distinct discomfort upon deep pressure over the gan-

glion, although there is no longer a sense of pain, nor does pressure on this region produce pain in the eye as it formerly did.

A careful reëxamination of the eye at this time showed the appearances before recorded to be unchanged. Moreover, a keratitis in all respects similar to the one which had developed in the left eye, had also appeared in the right one as the sequela of many pain-periods. The light projection was good in all parts of the field. A perimetric chart of the field of vision showed no defects other than those explained by the corneal opacity and a somewhat drooping upper eyelid. No increase of tension was observed at any time. The pains now occurred with great frequency, always once daily about 10 A. M., sometimes twice, when the second one would take place about 7 P.M., occasionally a third one in the middle of the night or early morning. The onset of a pain was as sudden as a lightning-stroke, was instantly followed by œdema and discoloration of the eyelids, reddening and swelling of the conjunctiva and excessive lachrymation. A brawny flush overspread the brow and face, the veins became turgid, the carotids throbbed visibly, the woman bent and trembled in her agony, and presented a picture of utter misery seldom witnessed. If an anodyne was withheld, in a few minutes a muco-purulent catarrh appeared and within the hour gray sloughs upon the conjunctiva, until the whole eye resembled, at the height, an attack of purulent ophthalmia. If morphia sufficient to stop the pain was given, and it was the only remedy of any avail, the appearances just described would subside as quickly as they had appeared. We have often observed an attack come on, reach its height, and disappear with scarcely a remaining trace within an hour or at most two hours. A careful retrial of former remedies was instituted. Quinine, arsenic, and oil of eucalyptus produced no results. Anti-rheumatic remedies, especially the salicylates and oil of gaultheria, gave, if any, the most temporary relief. No favorable response was given to antipyrin and antifebrin. The former was used not only by

the mouth but also hypodermatically after the manner of Germain Sée.[1]

It was observed that the pain apparently started just below the tendo-oculi, and after its subsidence this spot remained tender. Partially inspired by this fact, and remembering the published successes of Badal[2] in the treatment of glaucoma and ciliary neuralgia by stretching and extirpation of the external nasal nerve, an operation of this kind was determined upon. Following the method described by Brailey (*British Med. Journal*, October 10, 1885), the supra-trochlear nerve was exposed, stretched until it broke, and then a piece one centimetre long excised. This operation was performed on June 21, 1887, the patient having had a pain shortly before the incision. Healing was perfectly normal. For one week there was absolute relief, but exactly seven days later, or on the 28th of June, the pain returned. At first this was less violent than formerly, but soon returned to all its severe and usual characters and also its tendency to appear about 10 in the morning and 7 in the evening.

Experiments now elicited the fact that if at the beginning of an attack a hypodermatic of half grain of cocaine was injected along the course of the supraorbital nerve the pain would be distinctly allayed, although it would return after the effects of the drug had passed away. This led to the second operation of stretching and excising a portion of the supraorbital nerve on August 9th. A period of relief again occurred, but precisely seven days later, viz., August 16th, a slight but still decided pain appeared, and two days later an intensely severe one. Disappointed at the very limited result of this operation, and also noting the small area of anæsthesia which had resulted (an oval patch just above the brow), it was thought that probably a branch and not the main stem of the

[1] It may be interesting to note that during the free administration of antipyrin the patient was seized with a sharp attack of dysentery, abdominal pain, tenesmus, and frequent bloody stools.

[2] Traitement de douleurs ciliares par l'élongation du nerf nasal externe. Ann. d'ocul., lxxxviii. 241–253, Brux., 1882.

nerve had been secured. Hence the incision was renewed and a careful dissection made down to the foramen, where the

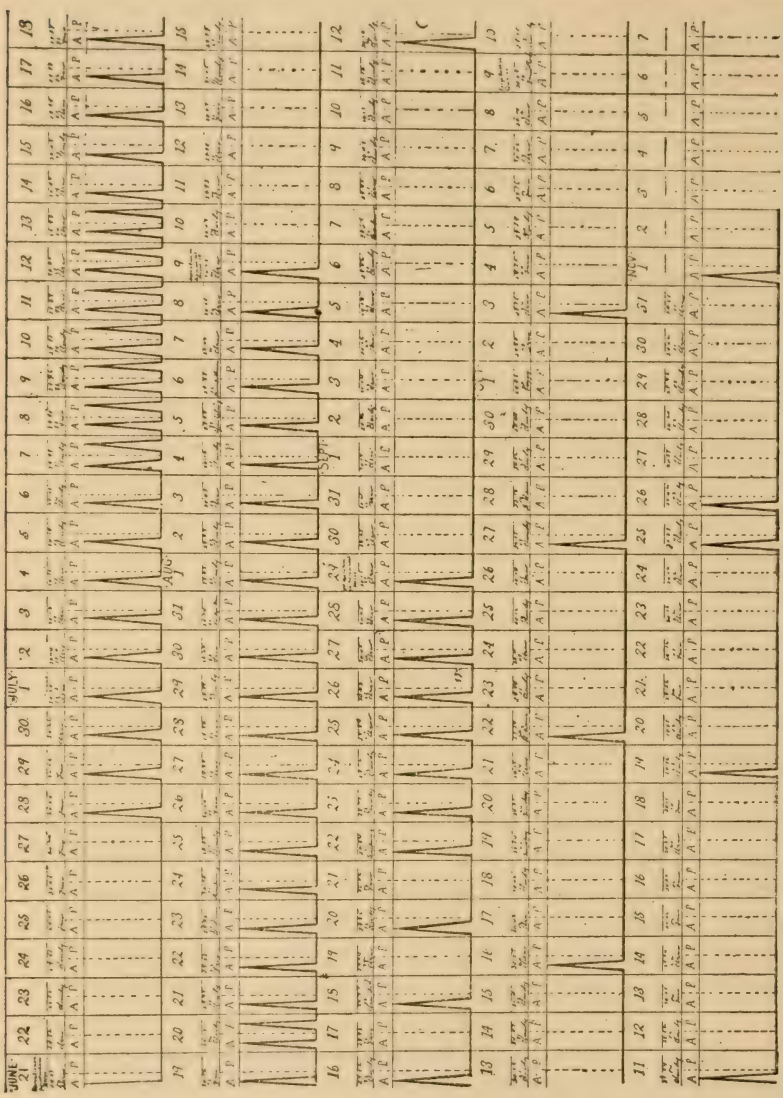


FIG. 1.

Tracing representing pain-periods during 134 days. Each triangle represents a pain-period; the unbroken line the absence of pain. The condition of temperature, etc., is noted above each day. A=A.M., P=P.M.

nerve was seized, dragged forward and cut off, and then dissected up for two inches and excised. For two weeks there

was an entire absence of attacks, but on the fourteenth day a slight pain occurred, and four days later a severe one. Thus the tendency for these attacks to return on the seventh or multiple of a seventh day was again manifested. From this time on, however, this rule was not strictly adhered to and the type occasionally varied, as an examination of the accompanying chart, which represents the pain periods during the one hundred and thirty-four days, will show. It will be seen that pains appeared upon the fifth, sixth, and eighth days, as well as upon the seventh days.[1]

The condition of the atmosphere and the changes of the weather have no influence in the production or absence of pain in this woman.

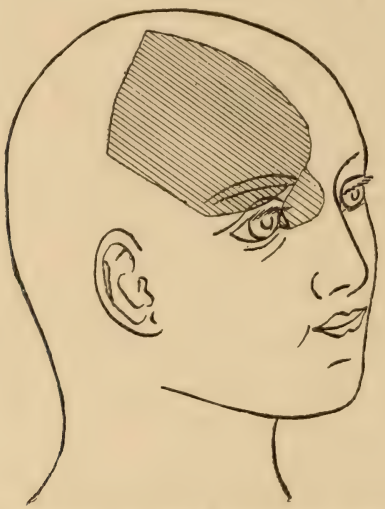
Even after the violent ciliary neuralgia that this patient has suffered, and in spite of the scar tissue in the cornea, the vision remains fairly good. At its best it is $\frac{15}{XL}$; three hours after an attack $\frac{15}{LXX}$, while during a pain-period acuity of sight is reduced to a mere perception of large objects. The field is as has already been described.

The mental condition is excellent, the memory entirely unimpaired. The knee-jerks are perfectly normal. There is no region of impaired muscular ability or unequal muscular energy. Hyperæsthesia and anæsthesia are absent, except the area of anæsthesia which followed the nerve section. The blood has been examined before, during, and after pain-periods in order to determine the presence or absence of the microorganisms peculiar to malaria. These examinations have been entirely negative. Dr. Osler and Dr. G. Dock kindly aided in this investigation. The blood had not only been taken in the usual manner from the finger, but recently we introduced a sterilized hypodermatic needle into the spleen, after the man-

[1] At the present time the type has been reëstablished and the pains occur weekly, just seven days almost to the hour elapsing between each pain.

ner described by Dr. Councilman,[1] without discovering any evidences of chronic malarial poisoning. Repeated examinations of the urine have yielded a specific gravity varying from 1.012 to 1.022; the entire absence of albumen and sugar; a sediment negative, except upon one occasion, when a few small hyaline casts were discovered.

Fig. 2.



Shaded portion represents the area of anæsthesia after excision of the supratrochlear and supraorbital nerves.

Our colleague, Dr. John H. Musser, has kindly examined the heart and splenic area and reports as follows: High tension, relative accentuation of the second sound, hypertrophy of the left ventricle and two systolic exocardial friction murmurs. Loud venous hum in the neck. Spleen not enlarged. A thorough inspection of the naso-pharynx by Dr. E. Martin revealed the parts in a fairly normal state; this is especially true of the left side. Upon the right side a small hypertrophy projects into the nasal cavity. The sense of smell is less acute

[1] Lecture to Path. Soc. of Philada., Oct. 17, 1887. Further Investigations with the Corpuscles of Laveran.

upon this side. The upper jaw contains no teeth except two fragments—the remains of canine teeth. In the lower jaw the incisors, canine, and two bicuspids remain, and are not carious. The gums are not tender in any place, and there are no appearances of such morbid processes as the late Prof. Gross has described to be a cause of neuralgia. The tongue is clean, the appetite good, the digestion unimpaired. There is no evidence of hepatic derangement.

Dr. B. C. Hirst has made a utero-vaginal examination and reports the condition perfectly normal for the patient's time of life; the uterus and broad ligaments are healthy, the ovaries unrecognizable. The temperature usually varies from 97° to 100.2°, and this variation has never conformed to any regular type. This character of temperature, occasionally slightly above the normal, and again below it, is, we think, always present. It has certainly always appeared whenever any thermometrical records have been made.

It has seemed to be the part of wisdom simply to present the report of this case without entering upon any theoretical considerations, for the good and sufficient reasons that seven years of theorizing and experiment have failed to achieve any very brilliant results. Quite naturally the malarial origin of this disorder has been discussed, but it certainly falls in the light of the failure of therapeutic tests and the examination of the blood.

The possibility that this is a form of rheumatic or gouty neuritis is deserving of respect. But inasmuch as there is an absence of any rheumatic history, of any symptom indicating a lithæmic diathesis, and, to a less degree, as there was no response to anti-rheumatic treatment, it seems an untenable position. Prosopalgia, of the most violent type, has certainly followed the pressure of growths upon the Gasserian ganglion, and in a case by Laveran a fibrous degeneration of the ganglion

itself was the cause of the pain. It is difficult, however, to accept this explanation in the face of the history of this disorder, beginning, as it did, in a cicatrix in a region under the supply of spinal nerves, necessitating, moreover, as it does, the belief that first the left and then the right ganglion were respectively the seats of disease.

The idea that these pains may be due to a disorder of the sympathetic nervous system and depend upon derangement of the vaso-motor tonus presents to us, we confess, many attractions. Dr. Wood has pertinently remarked, "These severer forms of prosopalgia are capable of being arranged in two groups—those in which a lesion can and those in which it cannot be demonstrated." This is certainly one of the forms in which, thus far, it has not been demonstrated.

[After the reading of the preceding paper :]

Dr. Shakespeare said : The history of this case, which I may say has been prepared exclusively by Dr. de Schweinitz, is a most curious one. When the case first came under my observation, the peculiar condition of the tissues over the middle cervical sympathetic ganglion attracted my attention. During the four or five years preceding the time when this case came under observation, I had seen a number of cases of persistent ciliary neuralgia with other affections of the eye in which a similar sensibility to pressure over the region of the middle cervical ganglia had been present.

The first case of this kind that I had seen occurred in 1875. This was pointed out to me by the patient himself, who was a physician. He had been obliged to give up his business and do nothing for several years in consequence of the violent neuralgia of the eye associated with a high degree of astigmatism. In this case, pressure on the eyeball caused pain in the neck on the same side, and *vice versâ*, pressure over the middle cervical ganglion caused pain to shoot into the eye. Acting upon this suggestion, I began the use of counter-irritation over this region, gradually increasing the strength of the counter-irritant until the actual cautery was reached. After the use of the cautery the neuralgic troubles entirely disappeared.

A few months before the case reported to-night came under observation I had another case similar to that to which I have just referred. This was a case of persistent severe neuralgia associated with refractive trouble and this peculiar condition in the region of the cervical sympathetic ganglion. In this second case there was also some tenderness over the spines of the dorsal vertebræ between the shoulders. The treatment was similar to that employed in the first case and was successful. In the course of twelve or thirteen years I have met with ten or twelve cases of ciliary neuralgia sometimes associated with clonic or intermittent spasm of the ciliary muscle, with derangement of the refraction, and associated with tenderness

over the middle cervical ganglia, and in every case with the one exception reported to-night, treatment by counter-irritation, in most cases carried up to the actual cautery, has proved successful.

I might mention another case which may throw some light upon the nature of the cause of this trouble and upon its pathological seat. A gentleman came under my care in 1883. He was an active man interested in large enterprises. In the spring of 1882 he had had a great deal of mental strain. In the fall of the same year he began to be troubled with a tendency to perspiration over one-half of the body. When in the barber's chair his attention was first called to the fact that there was a region of the head and nose where the perspiration was more profuse than in other parts. When he came to see me there was, a few minutes after the beginning of the examination, profuse perspiration over the right side of the face while the rest of the skin would be comparatively free. There was no flushing of the face when the perspiration occurred. Within this area of excessive perspiration there was a smaller area in which the sweating was even more marked. This area extended over the brow down to the right ala of the nose and to the median line. The sweat actually poured from this area. The corresponding areas on the opposite side of the face were said by the patient to be unusually dry. I found in this patient in the region of the middle cervical sympathetic ganglia, the same tenderness of which I have spoken. The patient came to me on account of eye trouble. He had persistent ciliary neuralgia and also some error of refraction. I found that by pressing on the middle cervical region pain would shoot up into the eye and into the side of the face and would be most marked in the area of excessive perspiration. As in the other cases, counter-irritation was successful. I mention this case as it may have some bearing upon the points brought out in the history of the case of A. L., reported by Dr. de Schweinitz.

ARACHNOID CYSTS OF THE BRAIN.

By

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[Read January 4, 1888.]

Case I.—Mary C., æt. thirty-two, died in the Philadelphia Hospital September 21, 1887.

Autopsy.—On removing the dura mater, four cysts were found situated upon the cortical portion of the brain. There were two cysts on each side of the median fissure; those on the right side were irregular in shape, and each somewhat larger in size than a walnut. They were situated mostly over the occipital lobe, but the outer one particularly extended over a portion of the parietal lobe. On the left cortex, the cysts were much larger; the one close to the longitudinal fissure partly covered the occipital and parietal lobes, and was three inches in length by an inch in diameter. The outer and smaller cyst occupied a position over the occipital lobe, but extended somewhat over the parietal lobe. The walls of the cysts were composed of thin lamina of membrane, and contained a clear fluid.

Owing to the pressure occasioned by the cysts, extensive atrophy of the convolutions of both occipital lobes had occurred, but upon the left side the convolutions of the superior portion of the parietal lobe had been decidedly involved in the atrophy consequent upon the pressure. This process was so marked that the surface of the left cerebrum

was depressed half an inch below that of the right, and the entire left hemisphere occupied by the cysts appeared distinctly smaller. The close proximity of the cysts upon the left side to the fissure of Rolando shows that the motor tract on this side of the brain must have been subjected to irritation by pressure during the development of the cysts.

This specimen has two special aspects of interest, the pathological and the clinical. Considered from the standpoint of pathology, I incline to think the cysts were congenital, because they were bilateral, and associated with marked atrophy of the cerebral convolutions.

The cysts may have originated from extravasation of blood into the sac of the arachnoid. The cause of such extravasation may be difficult to explain; but instrumental deliveries in childbirth have been supposed to share in determining this condition, and the same may be said of falls or blows received on the head in infancy.

The following case, taken from the Reports of the Norristown State Hospital for the Insane, 1885, seems an example of large arachnoid cyst from extravasation of blood:

Autopsy, eight and a half hours after death.—On raising the calvaria, which exhibited nothing unusual, two large hematomata were found, completely covering the superior aspect of the hemispheres—that is to say, they completely filled the vault of the calvaria. The walls of the sacs were quite firm, and they contained a dark bloody liquid. They separated easily from the dura, and were in no way attached to the pia. The pia was slightly opaque and thickened. The diameter of the sacs at their thickest portion was upward of an inch. The convolutions of the brain were small and shrunken. On

section, the gray matter appeared thin on the upper surface of the convolutions, but normal in the depths of the sulci. The substance of the brain was firm. The lateral ventricles showed slight reddening of the ependyma.

Microscopic examination of the cortex revealed no change beyond an apparent decrease in the number of cells in some places, and a slight general increase in the neuroglia.

Arachnoid cysts are seldom observed in a recent state, and from their usually having existed for a long period before they are examined, the effused blood is found to have undergone considerable modifications. The fluid usually is thin, clear, and serous. The walls of arachnoid cysts are commonly adherent to the dura mater by loose adhesions, and are at first brown and rough, even laminated, becoming in lapse of time smooth and polished.

The pressure of such cysts upon the cerebral hemispheres may produce atrophy of the convolutions, as in the case under consideration. The pressure of arachnoid cysts sometimes may so diminish the thickness of the parietal bones as to cause a local bulging tumor known as external, partial, or local meningeal hydrocephalus. It is possible for the entire arachnoid sac to become one large cyst. There is a specimen of this so-called external or meningeal hydrocephalus in the Wistar and Horner Museum at the University of Pennsylvania.

It is interesting to note that arachnoid cysts may contain concretions of cholesterin, cholesteatoma, and the scales may be interwoven with extremely fine microscopic hair. Even small plates of bone have been described in the walls of these cysts.

Arachnoid cysts must not be confounded with cysts

due to extensive loss of substance in the interior of the brain, whether due to hemorrhage, softening, or inflammation which leads, after absorption of the detritus, to the formation of cavities which are generally filled up in part by clear or turbid liquid. This special state of the brain has been described as the Gruyére cheese condition, état criblé, because the softening occurs in small patches, and the little cavities, when numerous, give the tissue a cribriform or sponge-like appearance.

Ziegler states that when softening has occurred round a small arterial branch, the space left vacant on absorption of the products of disintegration is often filled up by an accumulation of liquid in the adventitial lymph channel belonging to the vessel, which latter then looks as if it ran through a wide lymph-sac, resembling that caused by simple localized lymphatic stagnation or engorgement. When such cysts are large, and lie just under the pia mater, or at least not very deeply, the overlying tissue in general sinks in and leaves a subpial or sub-arachnoid space, which soon fills with liquid (see also monograph by Kundrat, "Porencephalie").

The chief interest pertaining to this particular case relates to its clinical history:

The patient had been the subject of occasional epileptic convulsions for twenty years. She passed four years in the Insane Department of the Philadelphia Hospital when she was twenty-four years of age, and during the last two years she had been at intervals an inmate of the wards for nervous cases in the Philadelphia Hospital. When I first saw the patient she had violent spastic contractions of the extensors of the arms and hands, legs and feet. The head was frequently violently retracted and fixed in full extension, with the face turned to the right side. The muscles of the lips and mouth were not markedly affected, but the speech was hesitating, and articu-

lation imperfect. The spastic contractions of the muscles were not constant.

The clinical history during the four weeks she was in my wards was marked by a febrile movement of the continued type, typical of typhoid fever. The typhoid state was present, also diarrhœa. Indeed, the diagnosis of typhoid fever was entertained as the most probable interpretation of the febrile symptoms, and at the autopsy the characteristic enteric lesions of typhoid fever were discovered.

During the progress of the case, it may be noted that there was conspicuous absence of symptoms pointing to inflammatory disease of the cerebral membranes, while, on the other hand, the spastic contractions, and the retraction of the head and neck already mentioned, rendered probable the suspicion of central cerebral mischief, since local spasms, which go under various names, such as cramps, twitchings, epileptoid attacks, athetosis or athetoid movements, are common symptoms of the morbid growths which affect the cortical motor area.

I have received from Dr. Wharton Sinkler the following notes of a case which has recently been under his care. The symptoms were so similar to those which I have described in the case which forms the basis of this paper that it seems probable that there are lesions in the same region, possibly also of a cystic character.

John S., æt. forty-four years, married. Occupation, "steam packer." Applied for treatment at the Orthopœdic Hospital and Infirmary for Nervous Diseases, August 29, 1887. He has always had good health except attacks of rheumatism. Denies syphilis, and says he has been temperate. About two years ago he had an attack of a convulsive nature while at work. It was attributed to excessive heat. After this attack he worked for eight or nine months, when he had another, and, after the convulsive seizure on this occasion, he continued to shake all over for several hours. Two weeks later he had a third attack, and since then he has not been able to work. The trouble was a general trembling, with unsteadi-

ness of gait, and at times the face and left leg were more affected.

Present condition.—The patient walks with extreme unsteadiness, due to almost complete want of the power of coördination. The walk is like that of an ataxic. When he attempts to walk, the arms are thrown about in various directions, and the fingers open and shut spasmodically, assuming the various positions seen in athetosis. While sitting there are occasional twitches of the left leg, but otherwise the limbs are at rest. The face, however, undergoes remarkable contortions, first one side and then the other. These spasmodic contractions of the facial muscles are most marked if he attempts to speak. The speech is much affected. There is no aphasia, but the words are jerked out in an irregular and hesitating way, but he does not use the wrong words. His mind is not impaired to a marked degree, but he is less intelligent than formerly; he is able to read. The movements of both hands are incoordinate, and he feeds himself with much difficulty; dynamometer: R. 100; L. 50. Knee-jerk exaggerated on both sides; ankle clonus present. The eye-ground was examined by Dr. de Schweinitz, but no anomalies were found.

The patient was admitted to the hospital and remained for several weeks. At first he had two or three convulsions, in which he rolled out of bed, and was unconscious for a short time. He was given iodide of potassium in increasing doses, up to one hundred grains, three times a day. He gained flesh and improved up to a certain point, but afterward became worse. No convulsions had occurred for some time before he left the hospital.

[After the reading of the preceding paper :]

Dr. William Thomson said : I desire to ask Dr. Bruen if he was able to make an examination of the eyes in his case ? It would seem from the seat of the lesions that the sight of both eyes should have been affected.

Dr. Bruen said : When the patient came under my observation she was so ill that it was not possible to make a satisfactory ophthalmoscopic examination. I have been unable find any record of an ophthalmoscopic examination in the history of the case. The patient evidently was not blind.

Dr. Wharton Sinkler said : I had intended to bring a patient here when Dr. Bruen read his paper, but I was unaware that the time had been fixed for to-night until I saw the call for the meeting this morning. The patient to whom I refer had been in the Infirmary for Nervous Diseases, but he has left and I could not reach him in time. The symptoms in this case were so much like those described by Dr. Bruen that it seems possible that the lesions are similar in the two cases.

The patient was a man working in a machine shop. He was well until five years ago, when he began to have want of co-ordination in the legs followed by want of coördination in the arms. He had a peculiar spastic gait, only very much exaggerated. The arms were very irregular in their movements. He would, apparently without any attempt at voluntary motion, have contortion of the face, sometimes on one side and sometimes on the other. The head was thrown back. The gait was remarkable on attempting to walk. Speech was distinctly affected, the words being jerked out. He also had one or two epileptic fits. In this case the eyes were carefully examined by Dr. de Schweinitz and nothing abnormal could be discovered. The similarity in the symptoms presented by these two cases is so marked that I am sorry I cannot exhibit the patient to the College.

NOTES

ON THE

TREATMENT OF WHOOPING-COUGH WITH ANTIPYRINE.

By

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[Read January 4, 1888.]

That whooping-cough is one of the opprobria of medicine scarcely needs to be remarked; and were this not admitted, the long list of therapeutic measures which have been employed in its treatment would prove that none of them has given satisfaction. Among the means of treatment which have been proposed and tried may be mentioned the use of belladonna, alum, quinine, opium, chloral, the bromides, cocaine, carbolic acid, cochineal, quebracho, gelsemium, salicylic acid, turpentine, resorcin, castanea, hydrocyanic acid, sulphur both internally and by fumigation, compressed air, asafœtida, peroxide of hydrogen, change of climate, cannabis Indica, inhalation of the vapors from the purifying chambers of gas-works, boracic acid and other drugs

by insufflation, pyridin, and amylene hydrate, which by no means closes the list. Even the laity have learned to know, or to suspect, how helpless the profession is in the treatment of many cases of the disease, and either let the malady run its course, or employ some of the patent medicines so widely advertised. This helplessness is, indeed, acknowledged by many of the ablest writers on the subject. Wiederhofer states that nearly all the drugs in the Pharmacopœia have been used in the convulsive stage with little or no effect. He says further, that new specifics are proposed toward the end of nearly every epidemic, but at the beginning of the next outbreak they are heard of no more, this being due to the fact that the medicine was only useful in the third stage. He claims, too, that the disease is never cured by change of climate. Henoch says, "You will, unfortunately, gain no honor by your treatment." He deems the affection incurable, and thinks that there is no plan of treatment which will cut short the paroxysmal stage, while in the third stage almost any drug *seems* to do good.

It does not come within the province of these notes to inquire into the nature of the disease. Although most probably of a myotic origin, the antiseptic plan of treatment, as such, does not seem to have much effect.

Whooping-cough is, I need not say, usually divided into three periods not very sharply separated from each other. The first or *catarrhal* stage lasts an uncertain time, but averages, according to Meigs and Pepper, two weeks. Squire says the duration is about one week, while Gerhardt gives it as varying from a few days to four or five weeks. The second or *paroxysmal* stage stretches over thirty to forty days or even a longer

time, during which there is no amelioration to be observed. The third stage, or *stadium decrementi*, begins with the evidences of decline in the severity of the symptoms, the cough becoming less paroxysmal and bronchial in character. The length of this period is very uncertain, continuing from ten to fifteen days to perhaps several months. The total duration of the disease Henoch puts at an average of eight to nine weeks. The malady is certainly not one to be regarded with indifference or to be let alone. Biermer calculates that 7.6 per cent. of the cases die, though Löschner's estimate of one in twenty-seven or thirty is adopted by Gerhardt. In England and Wales between the years 1858 and 1867, 120,000 persons died of the disease, and in Prussia, between 1875 and 1880, 85,000 succumbed. Any means of treatment, therefore, affording a reasonable expectation of checking its course in severe cases cannot but be heartily welcomed by the profession; but in testing it it is evidently of the highest importance that it be applied during the first or second stage. In this connection the article of Sonnenberger (*Deutsche med. Wochenschr.*, 280, 1887) on the use of antipyrine in whooping-cough is of so great value and interest that a short account of his results may not be out of place here. This author had under observation since 1884 two large epidemics of the disease at Worms, and becoming greatly dissatisfied with the usual methods of treatment he determined to experiment with antipyrine. As a check upon his results he treated some members of a family with this drug, and to others, taken sick at the same time, he gave quinine or chloral, or the bromides, or some other well-recognized plan of treatment. In other instances he administered antipyrine for a few

days, then allowed an interval to pass in which no medicine was given, and finally returned to antipyrine. In a short time it became clear to him that this drug exceeded in value all others which he had yet employed for the malady in question, and he has continued to use it up to the present time, a period of two and a half to three years. He treated about seventy cases of the disease with antipyrine alone, giving it in doses of one-seventh of a grain in quite young children, up to seven-fifteenths of a grain for larger children or adults, three times a day, though he believes much larger amounts might be given.

A most important fact is that the best results were obtained when the course of treatment was commenced at the beginning of the disease. Under these circumstances the affection lasted in all but three to five weeks, and was of a mild character with not more than six or seven slight paroxysms in the twenty-four hours. When it is remembered that an average case has, according to Eichhorst, twenty to thirty paroxysms in a day, while in a severe case the number may reach a hundred, it will be recognized what an improvement this is. But even when the treatment was introduced at the acme, and with the most unfavorable hygienic surroundings good results were obtained. The paroxysms often became less violent after the first dose, and after several days occurred less frequently. When the drug was stopped the symptoms grew worse, showing that the effect was actually due to its use. In only five cases did he observe complications, and there was no instance of antipyrine-collapse. It would seem then pure cavil to deny that in antipyrine we have a drug capable of influencing whooping-cough most power-

fully, especially in the first and second stages, where other means so often fail.

Encouraged by Sonnenberger's success, I have administered antipyrine in several instances of whooping-cough, and with excellent results. The number of cases is not large enough to be of great value except as confirming the author's statements, but it seemed to me better to report them now, rather than to wait with the object of adding to them. My experience agrees with that of Sonnenberger, that the drug is most efficient when given early in the disease. I make no claim, of course, that antipyrine is an absolute specific; indeed, the first of the cases briefly reported below is an instance, though the only one, of the total failure of the drug. Most of the cases show, I think, that it may prove of great value in this disease, though in some of them the treatment was begun too near the third stage to offer a decisive test.

Case I.—*August* 5, 1887. Thomas R., aged four years, has had a cough for three to four weeks, but has only whooped this week. Ordered antipyrine grs. ij t. d.

12*th*. Condition is much the same; increased dose to grs. iv t. d.

18*th*. No marked change. Ordered grs. iij every three hours.

19*th*. No improvement: the child had paroxysms every one to one and a half hours last night; the chest is full of mucous râles. Ordered grs. iv antipyrine every three hours together with an expectorant mixture.

September 12. The child has quite recovered.

Antipyrine proved absolutely useless in this instance.

Case II.—*August* 5. Nellie D., aged four years, is said to have had a cough for five or six weeks, and has whooped for

two weeks. Coughs up a little blood with mucus. A sedative expectorant mixture has had no effect; added to it to-day tr. belladonnæ gtt. iv t. d.

12*th*. Slight improvement only. Belladonna mixture stopped, and ordered antipyrine grs. ij t.d. and quinine gr. ij t. d.

18*th*. Certainly better, though she still whoops badly and vomits after it. Gave antipyrine grs. iij every three hours.

19*th*. Decidedly improving; observation ceased at this date.

The improvement in this case, though not very marked, was fully equal or greater than that following the use of belladonna.

Case III.—*August* 5. Carrie H., aged five years, has coughed for six or seven weeks, though the whoop was first heard about three weeks ago, and the paroxysms are now long, frequent, and followed by vomiting of mouthfuls of blood. Ordered antipyrine grs. ij t. d.

12*th*. Improvement began *at once* and was marked. The paroxysms are less frequent and severe, and no more blood has been vomited.

18*th*. There are not more than four or five kinks a day. Increased dose to grs. ij every three hours.

22*d*. Does not cough at all at night, and only once or twice in the day.

Although well advanced in the second stage, the sudden and permanent improvement shows the good effect of the drug. Patient nearly well in two weeks.

Case IV.—*August* 12. Willie P., aged four years, has coughed for three or four weeks and whooped for seven to ten days. The paroxysms are severe and frequent and he vomits very often. A few râles are heard in the chest. Ordered antipyrine grs. iij t. d.

18*th*. Both whooping and vomiting have entirely ceased. Increased dose to grs. iij every three hours.

22*d*. Still coughs occasionally, but does not whoop. Vomits only rarely.

This case is a beautiful example of the effect of the drug at the beginning of the second stage, with virtually complete recovery in six days.

CASE V.—*August* 12. Frank McG., aged two years, has coughed for some time, but has not whooped. Continued an expectorant mixture which he had been taking.

18*th*. The child commenced at about the time of my last visit to whoop three or four times a day, and his nurse has to go to him often at night on this account. Ordered antipyrine grs. iss every three hours.

22*d*. The paroxysms are decidedly lessened in number. For two nights he has needed no attention at all. Medicine continued.

A decided action on the part of the drug. The patient suffered later from a severe bronchitis for which treatment was required, but the paroxysmal character did not return.

CASE VI.—*August* 5. Mary B., aged seven years, has coughed for two weeks, and the paroxysmal stage is just beginning, as she has whooped and vomited for a few days only. Ordered antipyrine grs. iv every three hours.

12*th*. Very greatly improved; coughs but seldom and the kinks have nearly disappeared. Medicine continued.

18*th*. Does not cough at all. Medicine stopped.

A remarkable case in which the disease appears to have been aborted in the second stage, lasting scarcely two weeks.

Case VII.—*August* 15. Edward S., aged two years and ten months, has been whooping for a few days only, but severely, and vomits about four times in the day. The mother says she is up with him all night. Gave antipyrine grs. ij every three hours.

18*th*. The mother declares "the medicine worked like magic," and that the improvement has been the talk of all the neighborhood. The child has vomited only twice since the 15th, and does not whoop more than twice a day. The improvement began on the first night after treatment was commenced, and the mother did not need to be up either that night or any since. Medicine continued.

There can surely be no question that the very striking result experienced here, occurring as it did so early in the disease, was certainly due to the influence of the medicine.

Case VIII.—*October* 19. Annie M., aged fifteen months. A not very intelligent mother states that six or seven weeks ago the child coughed and whooped, but did not vomit. She grew better, but later became worse again, and for three weeks has had paroxysms every hour, followed by vomiting. Sleep is poor. Ordered antipyrine gr. j every three hours.

21*st*. No vomiting since last seen, and has "slept elegant." The child whoops still, but not so often. Increased dose to grs. iss every three hours.

November 2. Medicine continued until 28th ult. Child has been much better. Since that date no medicine has been given, but condition has remained improved.

25*th*. Cough had entirely disappeared; but a week ago the child became thickly covered with the eruption of varicella, and the paroxysms returned in full force, being very long and severe, though not very frequent, and not followed by vomiting. Ordered antipyrine grs. iss every three hours, which seemed promptly to relieve them.

The very sudden improvement when first administered indicated the power of the treatment, though the disease was probably too far advanced to offer a sufficiently severe test. The cessation of the paroxysms after November 25th would probably have followed the disappearance of the eruption in any case.

Case IX.—*October* 28. George B., aged three years, has coughed for two weeks, but has had no kinks until the last seven days, and is constantly growing worse. The paroxysms are not very frequent, but are sometimes very severe, and are often followed by vomiting. Ordered antipyrine grs. iss every three hours.

November 4. The child coughs a great deal less, and has only vomited once during the night since he was last seen. Sleeps so much better that he does not need the powders at night. No medicine has been given to-day, and but two doses yesterday, and to-day the child has commenced to whoop and vomit more than usual. Medicine renewed.

14*th*. Improvement again followed the use of the powders, but none has been given since the 10th, and the patient is, perhaps, a little worse, though greatly better than at the beginning of the treatment.

We have here an instance of aggravation of the symptoms following an intermission in treatment, and of permanent benefit after its renewal.

Desiring to make as thorough a trial of the value of the drug as was possible, I requested several medical friends to administer it in such cases of whooping-cough under their care as they might think best. The remaining notes are the result of their very kind assent. The first three cases were under the care of Dr. George E. Shoemaker, the next two under that of Dr. T.

Hewson Bradford, and the last under that of Dr. Wm. C. Lott.

Case X.—*August* 16. Sophie M., aged four years, has been whooping for from two to three weeks. Ordered potas. bromidi grs. ij, ext. quebracho fld. ♏ iv, tr. belladonnæ gtt. ij, every three hours.

23*d*. No better. Medicine stopped, and ordered antipyrine grs. ij every three hours.

26*th*. Practically well. Improvement began at once and has gone on steadily since the powders were first given. She has cough occasionally, and only at night, and the paroxysms are not violent.

Though, it is true, well on in the second stage, antipyrine was at once effectual where other remedies had failed.

Case XI.—*August* 6. Maggie S., aged sixteen months, has had a severe cough for some time.

9*th*. Characteristic paroxysms began about this date. Given tr. belladonnæ gtt. iij every three hours.

11*th*. No improvement, and paroxysms are very severe and frequent. Ordered alumin. gr. ij t. d.

16*th*. Condition unchanged. Ordered tr. belladonnæ gtt. ij, ext. quebracho fld. gtt. ij, potas. bromidi gr. ij, every three hours.

23*d*. The patient is slightly better, the paroxysms being reduced to about one every half hour. Substituted antipyrine grs. iss every two hours for other treatment.

27*th*. The paroxysms are much less frequent both by night and by day, and the mother declares the child to be much better.

A case where several of the well-accepted remedies totally failed, and where antipyrine was a decided success, and at once.

Case XII.—*October*, 1887. A child of five years. Had been under unknown treatment for two weeks or more without benefit. Whooping-cough well developed, with frequent daily and nightly paroxysms preventing the proper amount of sleep. Gave antipyrine grs. iss every two hours with immediate improvement as regards the severity and duration of the paroxysms, and with entire abolition of the attacks at night. The subsequent course of the disease is unknown, except that the father later expressed himself as highly delighted with the action of the medicine.

Another instance of sudden and great improvement at the acme of the disease.

Case XIII.—*September* 24. M. I., aged two and a half years. The disease had lasted through probably twenty-one days of the second stage. Ordered antipyrine grs. ij every three hours.

October 3. The mother reports that the child was much relieved after the first dose, and the paroxysms have continued to diminish in number and violence. Medicine continued.

14*th*. The improvement is still marked.

Case XIV.—*October* 1. J. H., aged one year, had been sick three weeks when first seen. Ordered antipyrine grs. ij every two hours.

3*d*. Mother reports marked improvement.

Both of these cases were, perhaps, too far advanced in the disease to constitute sufficiently severe tests; nevertheless, the first especially would seem to offer good evidence of the activity of antipyrine.

Case XV.—*August*, 1887. Robert H., aged three years. The disease had commenced six weeks before he was first seen by Dr. Lott. In the first week of observation the paroxysms

were frequent and violent, and often followed by vomiting of food taken, and by severe epistaxis, so that the child soon became very weak from starvation and from loss of blood. The usual methods of treatment were employed for a week, but without the slightest relief. Antipyrine grs. ij every three hours was then ordered, and other treatment stopped. After twelve hours amelioration began, and in two days the paroxysms were reduced to six or eight in the twenty-four hours, epistaxis and vomiting ceased, and the appetite returned. At the end of one week's treatment with antipyrine the paroxysms were brought down to three or four in twenty-four hours, and attendance was discontinued.

Although, perhaps, somewhat advanced in the disease, yet this case was an excellent example of the superiority of antipyrine to other plans of treatment. Such rapid and complete improvement following the administration of the medicine in so severe a case could scarcely be a mere coincidence.

PNEUMONIA: A STATISTICAL AND RATIONAL INQUIRY CONCERNING ITS MORTALITY AND TREATMENT.

By
HENRY HARTSHORNE, M.D.

[Read February 1, 1888.]

Medical practice, in its present state of scientific incompleteness, cannot do without "working theories." But it is of much consequence to discriminate between these and positively demonstrated conclusions. It is only a provisional, not an unalterable, allegiance that is their due. A regency, sometimes a dictatorship, in science, as in government, may be well—on occasion, even indispensable; but a regent must be ready to withdraw when the king comes of full age. King-truths are as yet, of course, few in medicine.

This brief preface is meant to introduce an assertion, which may appear to require more excuse than it affords. I believe that, among the fluctuations in medical practice during the past half century, none may be set down as more largely due to speculative opinion, and less based upon observed facts, than those concerning the treatment of acute inflammatory affections, of which pneumonia may be considered as a type. My medical recollections enable me to traverse a period of quite ex-

tended transition. Under the tuition of my father, who was a pupil of Dr. Rush, I had early personal experience, as well as observation, of so-called "antiphlogistic" practice; which, however, as then existing, had already reached the stage of careful moderation. Then followed a reaction; bringing in an approach to expectancy, with J. Hughes Bennett, and others; and then stimulism, with Dr. R. B. Todd and his followers; and leading the way to the more recent "physiological" rationalism, which is now characterized chiefly by an abandonment of old methods and principles, substituting for them experimentation with powerful agents, tried first in the laboratory upon animals, either in health, or in various conditions of traumatism.

All this is, of course, intended for the advancement of sound medical science; having for its practical end the cure or alleviation of disease, and the prolongation of life. This end justifies the cautious use even of unproved working theories. But, from time to time, it is well to look back, and compare results. Are we making real progress? Is the current "working theory" establishing itself by facts; or is it, instead, obtaining less actual success than that which it superseded?

Coming to the application of this question to pneumonia and allied affections, my opportunities of observation and acquaintance with the transition period, above alluded to, have led to some positive convictions. These have been not long since expressed, and reported in a medical journal,[1] in language so strong as to require to be supported by something more substantial and extended than general impressions and individual

[1] Discussion in Philadelphia Clinical Society; reported in the Philadelphia Medical Times, Sept. 4, 1886.

experience. This feeling has led to the preparation of the present paper.

My *thesis* is this: That the mortality of acute pneumonia, croupous and catarrhal, is decidedly greater now than forty years ago; especially when it occurs in young or middle-aged patients of previously good health; and that this increase of mortality coincides with a prevailing change of treatment, in such a manner as strongly to suggest, if it does not absolutely prove, that the principle of that change is erroneous, either in what it omits or in what it adds, or in both.

Looking for *data* on record to bring this thesis to a definite test, I will revert, in the first place, to a specially comprehensive summary upon the subject, issued while the anti-venesection movement was at its height. This summary was presented in an elaborate article in the *British and Foreign Medico-Chirurgical Review* for July, 1858. Familiar as its matter may have been to medical readers at that time, many physicians of the present generation are likely not to be acquainted with it. A *résumé* of its principal contents may, therefore, be here in place.

The article mentioned reviews especially some papers not long before published, by Drs. Alison, J. Hughes Bennett, T. Watson, W. T. Gairdner, Joseph Bell, and W. O. Markham. But it adds a large number of statistical facts, drawn from various continental as well as British sources. It remarks upon "the almost total abandonment of the lancet of late years." "Change of type," in part, at least, explained this, according to Dr. Alison. "Sounder pathology" was the explanation proposed by Dr. Bennett. Dr. Alison rejoins: "If Dr. Bennett's pathology leads to the belief that the prin-

ciple in therapeutics adopted by the great body of practitioners is false, it is a much better reason for setting aside his pathology than their therapeutics." The great body of practitioners, however, appear to have since been willing, for a time at least, to place under trial the principle of practice inferred from Dr. Bennett's pathology. What has been the result of this trial, is a question worthy of present investigation.

Drs. Watson and Gairdner, in the discussion referred to, essentially agreed with Dr. Alison.

Looking over the facts, the *Medico-Chirurgical Review* gives an account of the practice of several distinguished leaders in the profession. Bouillaud's method of pneumonia, like Cullen's, was bleeding, *coup sur coup.* So was that of Sauvages, Chomel, Louis, and Grisolle. Their employment of the lancet was terribly extreme; with patients advanced in life, it was clearly destructive. Rasori, in Italy, was even more sanguinary in his practice. Laennec was much more moderate with the use of the same kind of treatment, and was more successful.

Skoda, for twelve or thirteen years, only occasionally resorted to bleeding in pneumonia. Dr. Balfour, however, reports him as saying that in 1840 he treated 64 female patients with large bleedings and large doses of tartar emetic, with but 1 death. Yet, in the same year, he had so many deaths in male subjects as to bring his mortality up to 1 death in 8 cases. This was considered by Skoda to be the average result of the treatment of pnèumonia under all methods. Balfour, about the same time, watched the treatment of 19 cases in the Homœopathic Hospital, under Fleischmann; 3 died, 1 in $6\frac{1}{3}$. Dietl published an account of his comparatively successful treatment of pneumonia

without bleeding. But his statistics lack such particulars in regard to his fatal cases as would make practicable a comparison with those of practitioners who have used general or local bleeding. He reported 1 death in 13½ cases treated by diet only.

In the review now cited, many details are given in regard to the management of pneumonia, by Trousseau (who gave tartar emetic in large doses), by Huss, Kissell, Wittich, Cohn, Niemeyer, Wunderlich (who returned to bloodletting), and others; including treatment with inhalation of chloroform by Baumgärtner, Wucherer, Helbing, Varrentrapp, and several other practitioners. Consideration is very properly given to the influence upon the result of age, constitution, season, climate, previous destitution, stage of the attack when treatment was begun, type of the disease, whether sthenic or "typhoid," complications, hospital accommodations, and surroundings.

After the age of sixty years the mortality was notably greater, especially under large and frequent bleedings. As to sex, more women die in hospitals of pneumonia than men, because more old women than old men become hospital patients with that disease. Race, also, has its effect. In the hospitals at Bombay, Morehead and Storer recorded, during ten years, 22 cases of pneumonia in 12,000 European patients, of whom 2 died, 1 in 11; while of natives, there were 313 cases of pneumonia in 26,000 patients, of whom 121 died, 1 in 2.6. Pneumonia has a worse mortality among Negroes, Hottentots, and Malays than among Europeans.

Of the seasons, winter is everywhere the time of the greatest number of cases of pneumonia: in Great Britain 3 to 1 as compared with summer, and with a

still greater proportionate mortality. Statistics referred to in the article now under analysis, make it apparent that "dry cold is the prime cause of pneumonia." It is more frequent and mortal in Paris during March and April than during January and February, because, although not so cold, the former months are dryer. While attacks of it are scarce along tropical shores they are abundant and severe in elevated regions; as in the valley of Puna, Peru, at an elevation of 12,000 feet; and at Briançon, France, 4285 feet. The headquarters of pneumonia are said to be Paris, Northern Italy, parts of Germany, and several places in more Northern Europe. More of it occurs in Scotland than in England; and less in the United States than in Great Britain.

Among British troops, the home mortality, as stated by the same authority, 1858, was, from pneumonia, 1 death in 13 cases. In British North America 1 in 11 to 1 in 25; at the Cape of Good Hope, 1 in 12; near the Cape frontier, 1 in 20; near the Mediterranean, 1 in 15 to 1 in 47; West Indies, 1 in 15 to 1 in 28. As these figures must be supposed to be derived from reports of a number of years, they no doubt represent the mortality of pneumonia for a time mostly included in the period of moderate general and local bleeding.

With hospital cases, a very important item is, the frequency of admission late in the attack. Always unfavorable, this is particularly bad under a routine treatment by large and repeated bleedings. No hesitation is called for, about saying that such must be the worst possible treatment at a late stage of the disease.

Records of hospital cases often have their value lessened by the absence of statements as to age, pre-

vious health and habits, stage of the attack on admission, etc. By selection of cases for a special treatment it might be possible to produce a show of results of a quite misleading character.

Much is said by authors concerning differences of *type* in pneumonia; sthenic and asthenic or typhoid cases. There is, undoubtedly, ground for the distinction; but the last named terms are probably often misapplied. Dr. La Roche and others, among them several medical officers of the U. S. Army at Southern stations, have long since established the existence of a malarial pneumonia, the "winter fever" of some localities in our Southern States. A considerable number of such cases are of a "typhoid" type. But I venture to believe that this term has sometimes been applied to cases which were simply not doing well, and thus reached a stage of depression or prostration which might have been prevented by suitable early treatment. Of this, more hereafter.

The question of *change* of type, through longer or shorter periods, is one of difficulty. All that approaches certainty about it is, that, in city populations, the tendency of artificial living, of what we call our civilization, is to lower the average grade of vital resistance. Defect of vital tenacity is especially conspicuous among the poorer and every way least-favored people who furnish the bulk of patients in hospitals. Success with the lancet in treating them should count for more, and that with stimulation for less, than in private practice; because they, less than any others, are likely to be robust enough for bleeding, while by habit with many, and by general condition with nearly all, they are apt

to bear alcoholic and other stimulation better than those who are able to be treated at their homes.

Hospital mortality varies much, even in the same institution at different times. As examples, that of pneumonia was, at the Hotel Dièu, in Paris, 1 in 4½ in 1787, 1 in 7 in 1822, 1 in 9 in 1839, 1 in 7.32 in 1848. In the hospitals of Lyons it was 1 in 13 to 1 in 11 in 1787, 1 in 11 in 1822; at Padua 1 in 12 in 1821; Vienna, 1 in 12 to 13 in 1787, 1 in 6 in 1824, 1 in 7.2 in 1856; in the Edinburgh Infirmary, 1 in 25½ in 1787, 1 in 16.6 in 1817, 1 in 8.2 in 1842. At St. Bartholomew's, London, 1 in 8½ in 1787, 1 in 11.3 in 1819, 1 in 12.6 in 1834. In the Suffolk Hospital, 1 in 50 in 1835. The familiar fact need scarcely be reiterated, that the results are, as a rule, most unfavorable in the large city hospitals.

Making a careful scrutiny of the reported results of different methods of treatment, the *Medico-Chirurgical* reviewer above quoted, observes that "the strong very generally recovered, and that often speedily and well, who were treated by Chomel, Louis, Bouillaud, Briquet, and Grisolle, with repeated bleedings, especially when performed early in the disease." While, no doubt, such extreme treatment killed many weak and old patients, it is added that "a first or even a second bleeding rarely or never produces an injurious effect on cases of pneumonia unless the disease is of a low type, or in an advanced stage, or the constitution is deteriorated by old age, destitution, drunkenness, or disease, especially Bright's disease."

Dr. Bell treated 71 cases of pneumonia in the Glasgow Infirmary; 36 were bled without the loss of one; 6 of

these being bled from the arm, the rest locally, chiefly by cupping. We see that this was, from the standpoint of that period, moderate treatment. Even Dr. Hughes Bennett sanctioned small and moderate bleedings in some cases, particularly to palliate excessive dyspnœa and pain. A number of practitioners have always approved the use of venesection to relieve oppression from distention of the right heart, even at what cannot be called an early stage. The benefit resulting from this practice, with the absence of consequent serious debility, may be carried over for rebuttal of the excessive fear of exhaustion indulged by many in connection with the withdrawal of blood in the early part of the attack.

Allusion has already been made to Dietl's reports of cases, and their statistical insufficiency. He gave some account of 380 cases; 85 treated by venesection, 106 by tartar emetic, 189 by diet only; with a mortality of 1 in 5 of those bled—no doubt, largely and repeatedly. 1 in 13½ of those treated only by regulation of diet, without bleeding or medicine. Later, he treated 750 cases without bleeding, other particulars not given with a reported mortality of 1 in 10.8.

Dr. Hughes Bennett recorded a mortality of 1 in 21.7, without bleeding. His patients were comparatively young; their average age, 31 years.

The result of non-bleeding in pneumonia in the Vienna Hospital, in 1856, was very unfavorable; the deaths being 1 in 4 among the males, and 1 in 2.7 among the females. The general conclusion drawn by the *Medico-Chirurgical* reviewer from an immense mass of facts is that, while indiscriminate and repeated bleedings may often do harm, both experience and science

appear to press upon us the propriety of "the discriminating practice of moderate and early bleeding, general or local, in cases of more or less sthenic inflammation, and of refraining from it altogether in asthenic cases, whether as regards the character of the disease or the constitution of the patient."

The mass of facts thus alluded to includes published reports of between forty and fifty physicians in Great Britain and Ireland and different parts of Europe, giving account of 11,627 cases of pneumonia. Of these, 2751 cases were treated with bleeding, and 8876 without it. Among the latter, however, 452 cases had exceptional modes of medication, in the use of chloroform, lead, copper, or iron. Deducting these, the statistical comparison, so far as the figures have value, rests between 2751 cases treated with, and 8424 cases without bleeding.

I have carefully analyzed the tables in which these statistics are given, with the following as the principal results. First, the more remarkable instances on both sides may be mentioned. Lacaze reported, under large bleedings, in pneumonia, the loss of but 1 in 42; Joseph Bell (before mentioned), with bleeding, no death in 36 cases; Trousseau, without bleeding, but with tartar emetic, 1 in 26; Bennett, without bleeding or tartar emetic, 1 in 21.7. Skoda's experience in one year has been referred to; yielding under bleeding but 1 death in 64 women. Less stress, for our present purpose, may be laid on these exceptional figures, than upon those which deviate less from the general aggregate; but, so far as they go, they do not oppose the conclusion above cited on the subject.

The essential reported facts concerning these 11,175 cases may be set forth as follows:[1]

With bleeding, either often, a few times, or once, with or without tartar emetic, altogether, 1 death in 11.1 cases.

Without bleeding, under all treatments except with opium,[2] 1 in 9.7.

Large and repeated bleedings alone, 1 in 11.6.

Bleeding a few times, or moderately, alone, 1 in 12.3.

Bleeding and tartar emetic, 1 in 12.56.

Tartar emetic, no bleeding, no opium, 1 in 11.3.

Opium, without bleeding, 1 in 3.3.

Tartar emetic and opium, without bleeding, 1 in 3.8.

Chloroform[3] (9 practitioners, 280 cases), 1 in 23.9.

It is, of course, very desirable, in the present inquiry, to make as full a comparison as is practicable of the mortality of pneumonia in this country during what may be called, for convenience, the bloodletting period, and that which has followed the change of practice, dating about 1856, '57, '58. Not many reliable sources exist for such information. I know of none more definite than the returns of the medical officers of

[1] In a few instances I have had to be content with an approximation, as when a certain number of cases are reported, with *no deaths;* Dr. Bell's, at Glasgow—*e. g.*, 36 cases, treated with bleeding, and no death. The least room for error here has seemed to me to exist when it is supposed that the *next* case might have been fatal; estimating, for example, Dr. Bell's rate as 1 death in 37 cases. This being done alike on *both sides* of the account (under bleeding and non-bleeding treatment), can hardly have materially influenced the total result. Throughout the consideration of these statistics, I have leaned toward a large allowance in favor of the side opposite to my convictions. On behalf of these a much stronger case might have been made if my object had been anything but the actual truth.

[2] Except, also, with chloroform, lead, iron, and copper, as before stated.

[3] Not included in the 11,175 cases in which have been reckoned the others of this table. Considering the small mortality occurring under this treatment, it seems remarkable that it should have dropped out of view in latter years.

the United States Army. According to these,[1] between 1840 and 1854 there were in the army 1416 cases of pneumonia, with 127 deaths, 1 in 11.15; between 1855 and 1859, 657 cases, with 97 deaths, 1 in 6.67. From my standpoint, there may be seen in this increase of mortality during the second period, a measure of the influence of the then proceeding change in the prevailing "working theory" of practice.

This view receives strong confirmation from recent statements concerning the mortality of pneumonia. In the Philadelphia *Medical News* of December 11, 1886,[1] it is editorially mentioned, that:

"The rate of mortality in the large general hospitals in this country is rarely below—more often above—twenty-five per cent., which represents about the average death-rate from this disease in the Northern and Southern armies during the Civil War. In this country extensive statistics of pneumonia in private practice are not available; but in the recent returns of the Collective Investigation Committee of the British Medical Association the mortality was eighteen per cent."

As to the general fact concerning the prognosis of pneumonia forty years ago, few men have been more competent to pronounce an authoritative judgment than the late Dr. George B. Wood, of Philadelphia. He wrote thus, in the first edition of his *Treatise on the Practice of Medicine*,[2] published in 1847:

"In cases of primary pneumonia, of the common or lobar kind, occupying only a portion of a single lung, occurring in persons of a good constitution, and without complication of

[1] Medical Statistics of U. S. Army, 1839–1855, and 1855–1859.
[2] Page 660. [3] Vol. ii. p. 41.

any kind, there is every reason to hope for a favorable issue. Cases of this kind almost always end in recovery under proper treatment, and not unfrequently even without remedies, or with such as are improper. The disease appears to be remarkably mild between the ages of six and twenty-one. Of forty cases observed by Dr. Gerhard and M. Rufz in the Children's Hospital at Paris, occurring in children from six years old to the age of puberty, only one terminated in death."

Dr. Wood goes on to remark upon the well-known increase of danger produced by previous debility and old age, in double pneumonia, and in hospital patients, as compared with those seen in private practice.

The field of observation of Dr. Wood was, besides his private practice, chiefly in the medical wards of the Pennsylvania Hospital; his conclusions, however, being strengthened by a wide and thorough acquaintance with the medical literature of his day. His practice, with which, as resident physician in the Pennsylvania Hospital, from 1846 to 1848, I had ample opportunity to become familiar, was what might be called moderately "antiphlogistic;" consisting, usually, in cases not previously debilitated, and occurring in early or middle life, of bleeding, neither excessive nor frequent; early and thorough evacuation of the bowels by an active cathartic; small doses of tartar emetic; at night one dose of calomel, opium, and ipecacuanha, and the same, at a later stage, if improvement was slow, repeated at intervals during the day. There was reason for satisfaction with the results of this treatment; which was differed from on the part of the other attending physicians of the same hospital at that time, chiefly in the direction of less activity, though not to such a degree as to merit the name of expectancy. Many years

afterward, in conversation with Dr. Wood, he recalled the cases thus treated; especially one of aggravated double pneumonia, which recovered after early and free venesection.

I have lately investigated the records of the Pennsylvania Hospital, as a representative institution, with a medical staff excelled by none in ability and reputation, to ascertain the number of cases and deaths from pneumonia, at three periods: 1845, '46, and '47; 1865, '66, and '67; 1884, '85, and '86. The figures obtained by me are these: in 1845, '46, and '47, of pneumonia and pleuro-pneumonia, 16 cases and 1 death (which occurred on the day after the patient's admission); 1865, '66, and '67, pneumonia and pleuro-pneumonia, 27 cases and 5 deaths (one of them on the day after admission); 1884, '85, and '86, of pneumonia, catarrhal and croupous, and pleuro-pneumonia, 93 cases and 29 deaths (one on the day after admission). For the first period, therefore, we have a mortality of 1 in 16, or $6\frac{1}{4}$ per cent. For the second period, 1 in $5\frac{4}{10}$, or $18\frac{1}{2}$ per cent. For the third period, 1 in 3.2, or more than 31 per cent. It needs to be remarked that I have gone carefully over all these cases, as recorded on the books of the hospital, so as to eliminate any that could be suspected of a tuberculous character, as being really cases of phthisis instead of acute pneumonia; the diagnosis made and entered at the time of the *death* of the patient being always taken in the fatal cases.[1]

[1] A few cases not fatal but becoming chronic are included in this summary: 1 in 1884, in the hospital seven months and discharged cured; 1 in the house five months, 1 two months, and 1 over one month; all discharged as cured. In 1885, 1 in the house nearly three months, and 1 two and a half months, discharged as cured, and 3 who left the house marked *improved*. In 1886, 1 cured after two months, and 1 after nearly one month in the hospital. So far as any

Although the care taken in obtaining the above enumeration of cases and deaths from the records of the hospital was such as to make it difficult for me to suppose it not correct, my attention has been called by Dr. Osler to another computation of the statistics of pneumonia in that institution, recently made. According to this estimate,[1] there were in 1845, '46, and '47, 25 cases of pneumonia with 4 deaths, 16 per cent.; in 1865, '66, and '67, 29 cases and 7 deaths, $24\frac{1}{7}$ per cent.; in 1884, '85, and '86, 88 cases and 30 deaths, $34\frac{1}{11}$ per cent. So far as these periods are concerned, the comparison still bears out my assertion of the mortality being latterly more than double what it was forty years ago. Taking in longer periods, the statistics now referred to indicate a much less considerable difference, in that hospital, in the mortality between 1840 and 1850 from that between 1880 and the present year; but still the difference is enough to sustain the statement of a decided increase.[2] If we include in our account the record of Suffolk Hospital, England, in 1835, of 1 death in 50 cases, and accept the computation of the last-mentioned results in the Pennsylvania Hospital for 1845, '46, and '47, viz., 1 death in $6\frac{1}{4}$ cases, or 16 per cent., the mean hospital ratios of the two periods will abundantly show

doubtfulness of diagnosis might attach to these cases, their inclusion tends to better the record as regards mortality; by increasing the whole number of estimated cases of pneumonia not fatal, in the last of the periods considered.

[1] Probably the difference may, at least in part, be accounted for by the inclusion, in my cases, of those only in which the diagnosis of pneumonia was entered at the time of the *death* or *discharge* of the patient, as well as at the time of admission. Modification of the diagnosis is sometimes made necessary during the development of cases.

[2] The statistics mentioned give an excess of 3.2 per cent. of the mortality from 1882 to 1887 over that from 1842 to 1851; the latter being more than 31 per cent.

that the mortality in such institutions is much greater now than formerly.

As to the general mortality in the community from pneumonia during the same period, inquiry at the Health Office in Philadelphia failed to elicit statistics prior to 1860. The recollection of any physician long resident in this city may well give confidence to the belief that the number of deaths from pneumonia in proportion to the deaths from other causes, has largely increased. Dr. Lewis P. Gebhard, a practitioner of the old school, of large experience, beginning early in this century, told me near the end of his life that he never lost a patient with uncomplicated pneumonia. Dr. A. L. Loomis states[1] that, in New York, the average ratio of mortality from pneumonia to that from all diseases was 15.2 per cent. greater between 1859 and 1877 than between 1840 and 1858. In several weeks during the spring months of the year 1887, the deaths from pneumonia in Philadelphia numbered between 30 and 50 or more in each week; in the last two weeks of that year they were 39 and 47 respectively. More than 600 deaths from pneumonia occurred in this city in the first six months of 1887, in *minors*, besides a large number in adult persons, which total number I do not have at hand. A prevailing epidemic of measles may have aided in swelling this list; but my conviction needs also here to be expressed, that the mortality of measles, with or without the complication or sequela of pneumonia, has undergone an increase of late years, in consequence of the change, adverted to in this paper, in prevailing methods of practice.

[1] American System of Practical Medicine, vol. iii., article, Croupous Pneumonia.

How, then, in view of the facts thus brought forward, does the case stand? Accepting as authoritative the statements of *The Medical News*,[1] already alluded to, we find that the recent or present mortality of pneumonia is, in the hospitals of the United States, 25 per cent., or 1 death in 4 cases; according to the returns of the Collective Investigating Committee of the British Medical Association, 18 per cent., or 1 death in 5.55 cases.

Turning back to the times preceding the alteration in practice which began shortly after the middle of this century, the record is substantially as follows: Skoda's estimate of average mortality of pneumonia, 1 death in 8 cases. Balfour's report of a homœopathic hospital (treatment probably *nil*) 1 in $6\frac{1}{3}$; Dietl, with diet only, 1 in 13.5; British Army, 1 in 13, 1 in 11, 25, 12, 20, 15, 47, 15, and 28—*mean*, 1 in 20.66; hospitals in Europe, 1822 to 1856,[2] 1 in 9, 7.32, 11, 15, 6, 7.2, 8.2, and 12.6—*mean*, 1 in 9.54:[3] United States Army, 1840 to 1854, 1 in 11.15. As a total result, we may fairly estimate the average mortality of pneumonia, in the second quarter of the present century, as not more than 1 death in 11 or 12 cases, or from 8 to 9 per cent.; less than half the present estimated mortality of the same disease, according to the British Collective Investigation Committee, viz., 18 per cent. Moreover, it cannot have escaped the observation of many physicians, that the deaths from acute pneumonia, of late years, include a considerable number of men and women in the prime of life, who

[1] December 11, 1886, p. 660.

[2] 1787 (already quoted) is omitted, because, although percussion dates from Auenbrugger, 1761, there was less certainty of physical diagnosis before Laennec's introduction of auscultation, about 1818.

[3] Suffolk Hospital is here omitted, its exceptionally small mortality (1 in 50) being reported for only one year, 1835.

were previously in good health; a much larger proportion of these, I venture confidently to assert, than was anywhere known half a century ago.

Our next question is, What is the cause of this increased mortality? Several hypotheses concerning it are conceivable.

First, the records may be imagined to have undergone modification in consequence of improved methods of diagnosis. There is no ground for this supposition. In the decade from 1840 to 1850, physical diagnosis (as well as symptomatology) was, at least in regard to pneumonia, well understood among those whose reports have furnished the material for this investigation. So far as it may have been otherwise, it is well known that the tendency formerly was to include under the designation of pulmonary inflammation at least as many cases which would now be recognized as acute tuberculosis, as of any affection whose result might lower the rate of mortality.

Secondly, Does Dr. Alison's theory "of change of type" account for it? This may be hypothecated as either a change in the character of the disease, or in the average constitution of those subject to it. Neither of these appears to me to be so proved as at all to meet the requirements of the case. Pneumonia varies with locality, season, etc., but within not wide limits. Besides the allowable discrimination between cases which are open, active, sthenic, and asthenic or typhoid (as well, of course, as complicated cases), it is essentially the same disease that it was fifty or a hundred years ago.

As to a change in the average human constitution, admission has been made of the possibility, that artificial modes of living, with greater crowding of population,

may have somewhat reduced the average vital tenacity of men. But, against this, we have to put the much improved sanitary conditions of hospitals, and, nearly everywhere, of private dwellings, even of the poor. If, moreover, the increase of mortality from pneumonia of late years had coincided with the prevalence everywhere of the treatment of Chomel and Bouillaud, by bleeding *coup sur coup*, or of Rasori, by large bleedings, with half grain or grain or more (we read of six or eight grain) doses of tartar emetic, we might well believe the inappropriateness of such extreme measures to the present average man to have been shown. But the fact is, that the time of supposed lowering of constitutional resistance is also that of the withdrawal of reducing measures of treatment for inflammation; so that they, at least, cannot be charged with the result alluded to. My conviction is that the conception of change of type in the common constitution of men is exaggerated and misconstrued, if it is considered to account for a larger number of deaths from pneumonia (especially in private practice and with patients in the prime of life) under a predominantly stimulant treatment now, than occurred forty years ago under bloodletting and measures allied with it in practice.

We are brought thus expressly to the question of the relation between a change of prevailing treatment and the existing increase of mortality from pneumonia. The fact of the change of treatment is patent, and will, I presume, be conceded by all. It may be readily verified by reference to any of our medical periodicals;[1] which,

[1] See, for examples, Medical News, editorials, December 11, 1886, and March 19, 1887; Hospital Notes, Treatment of Pneumonia in New York, Philadelphia, and Massachusetts hospitals, March 5, March 12, and March 19, 1887.

more nearly than the text-books in use, reflect recently current views and methods of practice. We may safely characterize the now prevailing method or theory of treatment of pneumonia, in hospitals[1] at least, as exhibiting the following features: 1. The practically universal omission of venesection, and the very rare local abstraction of blood. 2. The general disuse of active cathartic medicines in the early stage. 3. By many, perhaps a majority of physicians, the early and continued use of alcohol, to the extent of from two to twelve or more fluidounces in twenty-four hours; quinine, mostly in ten to twenty grain doses once or twice daily; opium, or morphia, from the start, averaging perhaps morph. sulphat. one-twelfth to one-eighth grain every three or four hours; with deviations from or additions to this general plan, by the use of antipyrin, antifebrin, aconite, digitalis, etc.; and warm applications, as poultices or cotton batting, to the chest, or sometimes counter-irritation with oil of turpentine, etc. The treatment of croupous pneumonia advised by Dr. A. L. Loomis, in his article in vol. iii. of the *American System of Practical Medicine*, is essentially the same in principle as that now described.

[1] A resident physician in one of the oldest and best large hospitals in America, writes, in response to my inquiry concerning practice in pneumonia in that institution: "Venesection is practically never employed. . . . Local depletion is rarely employed. Salines or other cathartics are used as indicated by inaction of the bowel. Tartar emetic is not used. Nitrate, citrate, or acetate of potassium is never or very rarely used. . . . Quinine is used in doses of from six to twelve grains daily from the first; preferred in large doses near together. Alcohol is used when the pulse begins to weaken, in amounts varying from two to twelve fluidounces daily, or more in rare cases. Opium is used to quiet restlessness or irritative cough. . . . Carbonate of ammonium is used freely when the pulse has weakened, five or ten grains every two or four hours." Mention is made also of poultices, cotton or woollen jackets, etc.

What reasons can be assigned for this so considerable change in practice? We may briefly refer to three lines along which its justification may be proposed and attempted.

1. Is Dr. J. H. Bennett's view tenable, that a corrected knowledge of the pathology of pneumonia, regarded as a local inflammatory affection, should induce a change in its treatment? I certainly think not. Dr. Bennett's attention, as a pathologist, was almost exclusively given to the history of the exudation in inflammation, as Virchow's has been largely to cell-proliferation, and Cohnheim's to the migration of leucocytes. But no reasoning or observation, microscopic or otherwise, however it may add certain minutiæ, and may clear up, for example, the distinction between croupous and catarrhal pneumonia, can do away with the palpable main facts, that were as well known half a century ago. We have still the first stage, of congestion, and the second of red hepatization of the lung. We have, in other words, *stasis*, with interrupted nutrition, at the focus of inflammation; *concentric hyperæmia* there, and general vascular excitement of the system; then *exudation*, the nature of whose changes chiefly determines the final result, at least so far as the lung is concerned. The increased vascular tension following a local obstruction to the circulation, gave the indication for measures of relief of that tension in the older practice; and that indication still remains, in the presence of the most advanced researches as to either the crass or the minute morbid anatomy of pneumonia.

2. But a pathological view of a different kind has latterly claimed much attention in connection with the asserted microbic causation of pneumonia. The idea

that it is a constitutional, not primarily a local, disease, has found favor for a number of years with a few nosologists.[1] From this view, as a general statement, I dissent altogether. Many observations, since those of Friedländer, make apparent the occurrence of bacilli and micrococci in connection with inflammation of the lungs. Weichselbaum, of Vienna, reports the observation of a diplococcus, a streptococcus, a staphylococcus, and a bacillus, in a considerable number of cases. Sternberg,[2] while denying the pathogenic character of Friedländer's bacillus, adduces the evidence of Fränkel and others to sustain his belief that the micrococcus first found by him in human saliva is the microbe most frequently present in the fibrinous exudate of croupous pneumonia. Jaccoud has expressed a favorable view of this opinion (*La France Médicale*, May 7, 1887). Two questions need here to be considered: Is the essential dependence of the disease on the microbes demonstrated; and, if it were so, what relation should such a causation have to the treatment? The second of these questions only, is of direct importance to our present subject; but a few moments may be given, in passing, to the first.

In this, as in other cases of microbic investigation, it must, of course, be remembered (although not rarely of late almost if not quite ignored) that coincidence does not at all prove causation. But, in the instance of pneumonia, there are large series of facts right in the

[1] Dr. A. L. Loomis, for example, definitely propounds that opinion, in the American System of Practical Medicine, vol. iii., article, "Croupous Pneumonia."

[2] President's address before the American Public Health Association, Memphis, 1887.

way of accepting the theory of its dependence on microbic causation. Proverbially, promoted as it obviously is also by bad air and close living, it stands in an immediate relation to cold. I have cited already from an English authority a strong statement, based on extensive records in Great Britain and elsewhere, that *dry cold* is the great factor in the production of pneumonia.

Jaccoud, in a communication to the Académie des Sciences,[1] presents cogent demonstrative reasons adverse to the notion that pneumonia can be exclusively dependent for its causation on microbic infection, its usual primary cause being exposure to cold, especially dry cold; while he considers it not improbable that there may be a contributive morbific action of the pneumococci, affecting to an important extent the character of the disease. Jaccoud concludes that a rigorous analysis of the observations which he records shows recent microbic developments not to be subversive of anciently accepted truths, and that "progress should be sought in the productive reconciliation of traditional medicine with the discoveries of microbiology." In this recognition of a right relation of harmony between old and new facts and ideas, Jaccoud gives an example of philosophical method, such as is especially applicable to the inquiry in which we are now engaged.

Dr. Henry B. Baker, of the Michigan Board of Health, has recently made the evidence upon the causation of pneumonia definite and full. He has collected and compared more than 27,000 weekly reports from different parts of Michigan concerning diseases, and over 120,000 corresponding meteorological observations.

[1] La France Médicale, May 7, 1887, page 645.

His conclusion, thus strongly supported, is, that the prevalence of pneumonia is directly and constantly associated with a low temperature and a dry condition of the atmosphere.[1]

But if it were even shown that, notwithstanding such facts, pneumonia is either dependent upon, or is in a certain number of cases produced by, microbes: What effect should this have upon our views of its treatment? Of course it would be, in that case, reasonable to wish for some effective microbicide treatment. I cannot accuse any medical thinkers of such a fallacy as is involved in the conclusion, that, because a disease is believed to be of bacterial origin, therefore no treatment other than that which is capable of destroying bacteria can be suitable for it. But some ground does exist for a fear that the present enthusiastic study of pathogenic bacteriology has engendered, or promoted, a therapeutic apathy, which already had some encouragement in the despair of old methods existing in a certain number of minds. Yet to do the best we can is worth while, in so serious a matter as the practice of medicine, while waiting and hoping to do better in the coming time.

3. Excluding, then, the above hypothetical explanations as insufficient, my conclusion remains, that the change of practice referred to has had its origin in a

[1] Dr. Baker's theory for the explanation of this association is plausible. He ascribes it to the excessive exhalation of moisture from the lungs in breathing an air whose humidity is far below saturation; chloride of sodium being thus left (being not volatile) to accumulate in the lungs from the blood, in sufficient quantity to produce irritation and inflammation. Dr. Baker refers in confirmation of this theory to the well-known observations of Beale and Redtenbacher, of the presence of chlorides in pneumonic sputa, their absence at the same time from the urine, and their returning presence in the urine during convalescence. See Science, August 27, 1886, and Annals of Hygiene, December, 1886; also, Proceedings of American Climatological Association.

fluctuation of opinion, not justified by facts or reasoning, upon some fundamental principles of general therapeutics.

Primary among these is that which concerns the value of bloodletting, general and local, as a remedy. My conviction in regard to this has been implied already; and it would make this paper quite too long to extend its discussion. It is needful only again to say that the utility of the withdrawal of blood in giving prompt and often permanent relief to excessive vascular tension, such as exists in the early stage of acute pneumonia and allied affections, has been amply *proved* to me, on my own person, and on many patients. The importance of this excessive vascular tension, in the early part of severe acute local inflammations, does not seem now to be generally appreciated, as a pathological fact. Much less, at the present time, do many practitioners appear to be ready to recognize the potency of relief for it obtainable by the early and moderate abstraction of blood, in vigorous patients and sthenic cases.

A large part of this paper was written before I had opportunity to read Dr. MacDougall's article "On the Value of Bloodletting," in the July number, 1887, of the *American Journal of the Medical Sciences*. He speaks at some length of high arterial tension, especially in connection with renal disease. The prevailing tenor of his essay is very sound; but he appears to me to fall short on the subject now under discussion, when he says of pneumonia, that the occasions are "very few, and very far between, in which bloodletting is demanded." While venesection may probably be dispensed with in a majority of cases, early local bleeding, by cups or leeches, will do good in the greater number, when the

health of the patient has previously been good, and the age is less than sixty years.

Some other writers, besides Dr. MacDougall, have lately dealt with the question of the treatment of pneumonia; notably, Dr. J. L. Dorset,[1] of Virginia, who favors a return to the older methods; but the subject has not been a frequent one in recent medical discussions.

There is a condition closely allied, at least from the standpoint of practical therapeutics, to high vascular tension, and mostly its immediate sequel or effect, which does not, in the pulse or otherwise, present the same signs. This is cardiac, vascular, and organic—in a word, general or systemic *oppression*. We meet with this in the early stages of many attacks of acute disease, in which a kind of debility is present, very different in origin from the debility of exhaustion, and requiring a different treatment. An extreme example of this, occurring in my own practice, was that of a boy twelve years of age, whom, during the epidemic of 1849, I bled in an attack of cholera. He was in incipient collapse, and reacted while the blood was flowing from his arm; going on to recovery. Elementary, obvious and ancient as the lesson of such cases is, as to the practical difference between *oppressive* and *exhaustive* debility, it,

[1] Virginia Medical Monthly, 1886–7, xiii. p. 857. For other articles on the subject, see C. F. Knight, London Lancet, 1887, i. p. 207; Alexander, Lancet, 1887, i. p. 977; Claiborne, New England Medical Monthly, 1886–7, vi. p. 287; Phillips, N. Y. Medical Journal, 1887, xlv. p. 350; Records, New England Medical Monthly, 1886–7, vi. p. 440; W. Pepper, Medical and Surgical Reporter, 1887, lvii. p. 1; also a discussion in the Transactions of the New York Medical Association, published in 1886, ii. p. 128. Among the modes of treatment commended by some of these authors, is the use of turpentine, by inhalation and by the stomach, and that of ergot and of salicylic acid internally.

or at least its application, has apparently dropped for a time out of the current therapeutics of the present day.

Almost as ancient, though less obvious, has been the evidence of the value of general or local bloodletting as an *eliminative* agency. In the applicability of this, much more extensively than has yet been realized in practice, there is reason for great confidence. Animals bitten by venomous serpents have been known to recover speedily after the abstraction of blood. The microbic origin of diseases points right in this direction; since it is the present accepted view that pathogenic bacteria usually act, not as wasting parasites, but by means of the ptomaines and leucomaines which they produce. Removal of a certain portion of tainted blood must favor the relief of the system from the effects of poisons contained in it; concentrated nourishment at the same time favoring the reproduction of healthy blood. Even the men of the last generation knew the value of "bleeding and feeding" in some cases.

Parallel to the above-mentioned change is the virtual disappearance from practice of the old procedure of active catharsis in the early stage of pneumonia and allied affections. This omission is a loss, not a gain. Lawson Tait has recently shown the practicability of treating safely with purgatives even (surgical) peritonitis; the one disease in which, most of all except in enteritis, we have been especially taught their prohibition. Saline cathartics, like bleeding, lessen vascular tension, moderate excessive temperature, and promote the elimination of morbid elements from the blood. The late Dr. Joseph Hartshorne was accustomed to say that a principal reason for the occurrence of troublesome sequelæ after scarlet fever, measles, smallpox, etc., was

"the neglect of proper evacuation in the early stage of the disease."

In 1860, it fell to me to review, in the *American Journal of the Medical Sciences*, the "Clinical Lectures on Certain Acute Diseases," of Dr. R. Bentley Todd, of London. Dr. Todd, in that book, refers to "a notion prevalent in the schools," that "certain acute and sthenic inflammations are attended with an undue exaltation of the vital forces, both local and general, and that these must be reduced before the inflammation will yield." On this statement I then remarked:

"We are not aware of any form of disease whatever, in which it is a legitimate object of the physician to reduce, by treatment, the strength or 'vital forces' of the patient. But this does not prevent our occasional resort to the careful and moderate abstraction of blood, for the purpose of *restoring the balance of the circulation* in its disturbed states. And we believe it to be a mere imagination that the withdrawal of a few ounces of blood must *necessarily*, in *all cases*, make the patient weaker than he would otherwise become with the progress of his malady. There is no experience more certain than that, in cases of high sthenic inflammation, in the early stage, blood-letting promotes diaphoresis, diuresis, and the action of the bowels; the *very objects* which Dr. Todd sets before us in his eliminative treatment."

While Dr. Todd was to some extent an innovator, in his advice to give alcohol early and freely in all acute diseases, to meet the tendency to debility, he saw, as a clinical observer, the importance of attending to the eliminative functions of secretion and excretion. He said, in the work just mentioned:[1]

[1] Clinical Lectures, etc., Philada. edition, 1860, p. 275.

"When recovery takes place in pneumonia, there is always some kind of *critical* evacuation, either by sweats, or by urine, or by the free discharge of a purulent fluid from the bronchial tubes, or by pulmonary abscess."

Dr. Todd favored the occurrence of such critical evacuations by occasional purgings, and by large doses of the acetate or citrate of ammonium; avoiding opium, at least in large doses, throughout the treatment.

This avoidance I believe to be an important point of practice. There is no valid indication for, and there is much against, the use of opium at an early stage of pneumonia. In large doses, it is then almost certain to do harm; especially by lessening the tendency to free bronchial secretion, which ought to be encouraged. The language of Dr. C. F. Knight, of Mercer's Hospital, Dublin,[1] is hardly too strong, when he insists on "avoiding opium in all forms of pulmonary disease;" at least if we limit the application of this *dictum* to the early stages of acute inflammatory affections of the lungs. In paroxysmal dyspnœa, opium or morphia is often useful.

Saline "arterial sedatives" and promoters of secretion, viz.: nitrates, acetates, and citrates, of potassium or ammonium, and, in violent cases, the tartrate of antimony, were formerly used with much confidence in the treatment of the early stage of acute inflammatory affections. These seem to be now, in prevailing practice, substituted by quinine, antipyrin, antifebrin, etc., for the express purpose of reducing excessive temperature. Has this substitution been a gain? I believe not. The agents mentioned do not equal those of the mineral

[1] London Lancet, 1887, i. pp. 207, 208.

group displaced by them, in *increasing secretion* from the kidneys, skin, and bowels. They seem to act rather by force, as it were, chiefly through the nervous system, in depressing temperature. More harm than good, on the whole, is to be expected from them in pneumonia. Their utility in neurotic affections is attested by many observers. Dujardin Beaumetz, among others, while discrediting the asserted antipyretic value of acetanilide or antifebrin, asserts its positive merits in the treatment of epilepsy. Antipyrin has been found of decided service as a hypnotic in insanity,[1] in some forms of cephalalgia, etc., and as an antispasmodic in whooping-cough, as reported upon recently by Dr. J. P. C. Griffith, and others. This is a different *role* from that of medication likely to be available in the therapeutics of acute and uncomplicated visceral inflammation. In Dr. Pepper's interesting case of recovery from pneumonia in a child, under the use of antipyrin (reported last year in the *Med. and Surg. Reporter*), it appears to me that it was the special neurotic complication of a tendency to convulsions which received benefit from the antipyrin, rather than the pneumonia itself.

Testimony is accumulating as to the failure of the use of quinine in antipyretic doses in the treatment of pneumonia. Drs. Bartholow and Osler, in Philadelphia;[2] Drs. Kinnicutt,[3] Ripley,[4] Putnam Jacobi, Castle, Billington, and Emmett Holt, in New York; and Drs. Shattuck and Minot, of Boston,[5] are among those who dissent from the now common approval of this point of practice. Pilocarpin, from its degree of action in in-

[1] Gazette Hebdomadaire, Dec. 23, 1887.
[2] Medical News, March 5, 1887, p. 261.
[3] Ibid., March 12, 1887, p. 290.
[4] Ibid., Jan. 29, 1887, p. 133.
[5] Ibid., March 19, 1887, p. 318.

creasing secretion, especially that of the skin, promises more than the other agents mentioned; and some favorable reports of its use in pneumonia have been published.

Reference has been made on a previous page to the debility, of more than one kind, which may occur in cases of pneumonia, as in other severe acute diseases. Clinical writers often speak of *heart-failure* as a source of danger. Undoubtedly it is so. But in robust patients, under middle age, the *cause* of heart-failure, at least in the early stage, which is to be most apprehended, is the burden imposed upon the heart by the obstructed circulation in the lung or lungs. We cannot directly relieve this, as Dr. George Harley has lately done the parallel condition in the liver by hepatic phlebotomy.[1] But the next best thing can be done, by venesection in the stronger patients, and local bleeding in those of less vigor; seconded in both by early active catharsis and the use of medicines promotive of increased perspiration and urination. Vascular tension and pressure are thus so lessened that the heart may carry its load without exhaustion. The debility of a later stage in severe cases is another thing; but I am obliged to reiterate the assertion that not a few cases of pneumonia in recent times, under prevalent treatment, die during the first week; this being rather conspicuously the case with men of previously good health, and under fifty years of age.[2]

Under an apprehension of "heart-failure," in pneu-

[1] British Medical Journal, Jan. 15, 1887.

[2] It is interesting to observe that so eminent an authority as Dr. Osler is recently quoted (Medical News, December 10, 1887, p. 679) as holding that, in typhoid fever, "as it is possible that the defective elimination of the products of regressive tissue-changes may be, in part, at least, the cause of the so-called

monia, many practitioners now resort early to alcohol, in large or considerable doses. Dr. Todd's report of nine typical cases, in his "Clinical Lectures," makes it appear that he was, in his actual practice, more moderate than in his teaching. In that, he advocated the early and free use of alcohol in all acute diseases. There is much evidence that this is an extreme, unjustified, and often injurious practice. Enough for our present purpose to cite the testimony of the physician whom Dr. Todd entrusted with the task of analyzing his records of hospital practice.[1] He asserts that the mortality even from fever, in the hospital attended by Dr. Todd, was in a marked degree greater than that of any other hospital in Great Britain.

Broken-down patients, in or out of hospitals, and those who have been intemperate, may, when attacked with pneumonia, or any other severe disease, be expected to bear and often require active stimulation. But the considerations urged in this paper are intended especially to include and apply to the treatment of simple acute pneumonia, in patients not over middle age, and of previously good health. I think evidence has now been given, sufficient to show that pneumonia is a much more fatal malady than it was forty or fifty years ago; and that the coincidence of this increased mortality with a prevailing change of treatment, gives strong probability to the opinion, that the principles

typhoid symptoms, every effort should be made to keep active the skin and kidneys." This is excellent practice; but we see it added, on the same page, that "constipation may be disregarded, unless it persists longer than seven or eight days" Is seems to me to be hardly an antiquated idea that the bowels, as well as the skin and kidneys, aid in eliminating the products of regressive tissue-changes; and, however it may be in regard to typhoid fever, this eliminative function ought to be utilized in pneumonia, at least in the early stage.

[1] British and Foreign Medico-Chirurgical Review, October, 1860, p. 331.

lying, consciously or unconsciously, under that change of treatment, are erroneous, and ought to be modified.

Objectors to this view, and to the method of its advocacy in this paper, may very readily say that it is antiquated and obsolete. But, when *facts* are allowed to become obsolete, there is an end of science. No sensible person can urge the rejection of any opinion merely because it is old, or the acceptance or retention of any method of practice simply because it is new. *Something* might be expected to be settled by the accumulated experience of the profession, and handed down safely among its traditions, in a true archiatric succession, through our predecessors. Let us make what discoveries we may, and brush away all absolutely exploded notions. But scientific caution would enjoin much care in throwing aside or reversing principles of treatment commended by the testimony of ages. Among those which have best stood the test of time, and which ought, therefore, to be now, according to my judgment, restored to the place in practice from which they have of late, for a time, been excluded, are the principles of moderate early sedation and elimination, instead of stimulation and narcotism, in the treatment of acute inflammatory diseases, of which pneumonia is a type.

There is more room for question, on the basis of experience, between the treatment of forty years ago and pure expectancy, nursing the patient in bed without medication, than there is between the old practice and that which is now generally current.

Such is the conviction, forced upon me by long-continued observation of the field of medical practice, which I have thought it my duty to lay respectfully before the members of the profession.

[After the reading of the preceding paper:]

Dr. James Darrach said: I have been much interested in the paper just read by Dr. Hartshorne. I will not presume to criticise it, and only endeavor to formulate some of the thoughts suggested to my mind while listening to its delivery.

Statistics, upon which the conclusions of this paper seem largely based, are, I think, not very sure guides. Carefully recorded histories of accurately observed cases of disease are of great value to the physician when the age and constitution of the patient are noted, with the specific character of the attack, and the peculiar phase of the epidemics at the time (Dr. Sydenham laid much stress, I think, upon the latter factor). Ordinary statistics, not embodying all these, do not give us the proper data for drawing our conclusion as to the relative value of treatments, and I think that Dr. Osler has well illustrated this. For his explanation of the great mortality in the University Hospital of Philadelphia, is that the vitiated constitutions of the patients and not any peculiar commission or omission of treatment, for various treatments were tried, were the cause of this large proportion of deaths.

Now, as to the term pneumonia, I fear that it cloaks much ignorance. It is too generic, and the species included in this genius are too varied in their characters, etiologically and pathologically, to be treated in the same manner. In support of this view it will, perhaps, not be inappropriate to recall the remarks of Wunderlich. In his admirable treatise on temperature in disease we find the following: "This manifest complexion of the course taken by the temperature, which, as said before, must not be regarded as an anomalous casualty, must rather be regarded as an indication that widely different affections are designated by the common expression pneumonia." Again, "the designation of any form of disease as pneumonia is almost as superficial a classification as that which comprehends all diseases of the skin which run their course with

inflammation, under the name of dermatitis." Now with the still imperfect knowledge of this not single but multiple disease, would it not be prudent to hold to a tentative treatment, or at least be slow in adopting heroic measures?

I have undoubtedly seen many cases of pneumonia where convalescence would have been retarded, and even a fatal issue brought about by the antiphlogistic treatment.

I have been led from my own observations to attach considerable importance to the relation of the heart in this disease. I have seen a patient almost die while sitting up during the examination of the chest. I think that death is often due to this syncopal condition. Jurgessen puts this factor strongly in the foreground as a cause of death, and has in italics the following: "It is the *heart and always the heart upon which the burden is ultimately thrown.*" Dr. Hartshorne advocates bleeding to relieve the heart from pressure, and others have admitted the benefit of bleeding in the œdematous form of pneumonia. I would suggest the use of nitroglycerine to relieve the heart. And while the moderate abstraction of blood might be of service in the very early stages of a highly congestive form of pneumonia, and in this case it would be bleeding in pneumonia and not for pneumonia, to relieve a specially dangerous symptom. In most of the cases, especially in the stage in which we most frequently see them, this treatment would tend to weaken the heart when it needs sustaining. Bleeding in the œdematous form I should think entirely out of place. Some author whose name just now I am unable to recall, observes that for every ounce of good blood removed two ounces of watery blood take its place. This condition of the vital fluid would tend therefore to increase the tendency to œdema.

In my own treatment of pneumonia, I speak from memory. I have in the last twenty-seven years used the lancet but once, and have cupped not over two or three times, and have been so well satisfied with the results that I began to think that pneumonia was not the fatal disease so generally considered; and am disposed to adopt the view that it is of the nature of

a fever with its local manifestation in the lung or lungs, and self-limited. In some cases which I have seen I would think it as unjustifiable to take blood as in a case of anthrax. I cannot refrain just here to quote some remarks of that eminently skilful and judicious practitioner Dr. Stokes, of Dublin. In his treatise on the diseases of the heart and pericardium, I find the following: "Dr. Mayne concludes that in the present state of our knowledge there is no stethoscopic sign which can be considered pathognomonic of the first stage" (he refers to pericarditis), which he says is the more to be regretted as this is, of all others, the period at which most benefit *might be expected* from active antiphlogistic treatment." "It has already been observed," says Dr. Stokes, "however, that pericarditis as to its want of physical signs in the first stage, forms no exception in the class of thoracic diseases; it would be well indeed if every acute disease could be positively ascertained within thirty-six hours of its invasion, and it is possible too that the omission of that active antiphlogistic treatment, still so often employed in the first stage of inflammation, might be of no great detriment to the patient.

Dr. William Osler, after alluding to the value of Dr. Hartshorne's paper and to the distressingly high rate of mortality which prevailed in the Philadelphia Hospital, said: I think that exception may be taken to the statement that the mortality has more than doubled. The United States Census Report for the decade ending 1880 gives a total of 63,053 deaths from this disease, 8330 in each 100,000 deaths from all causes, against 8128 in 1870, 6874 in 1860, and 3755 in 1850, with the mean age of death at thirty-two. These figures certainly point to an extraordinary increase in the mortality all over the country.

The statistics of the large hospitals, however, do not show this in such a marked manner. I have taken the figures of three representative institutions: The Montreal General Hospital in the north, the Pennsylvania Hospital, and the New Orleans Charity in the south. At Montreal the statistics are available since 1853, and we find in the decade 1853–63 a mor-

tality of 16.2 per cent.; decade 1863–73, 16.1 per cent.; decade ending 1883, 23.7 per cent.; and in the years 1883–7, a mortality of 20.3 per cent. A total of 1012 cases with 206 deaths, a mortality of 20.4 per cent. It is interesting to note that the total number of cases admitted to the hospital, which has not been materially enlarged during the past twenty years, has increased with each decade. In 1873–83 as many were admitted as in the previous twenty years.

Taking the statistics of the four periods which Dr. Hartshorne took, in 1853, '54, and '55 the death-rate was 24.3 per cent. In 1863, '64, and '65, 12 per cent. 1873, '74, and '75, 29.1 per cent. 1883, '84, and '85, 16.1 per cent. These show a reduction in the recent death-rate, and do not indicate a regularly progressive mortality, such as could possibly result from any change in the methods of treatment.

By the kindness of Dr. Matas, I have been enabled to get the statistics of the Charity Hospital, of New Orleans, since 1830. In decades the death-rate has been as follows: 1830–39: 298 cases, died 133—44.6 per cent. 1840–49: 685 cases, died 242—35.3 per cent. 1850–59: 1172 cases, died 378—32.2 per cent. 1860–69: 747 cases, died 327—43.9 per cent. 1870–79: 1067 cases, died 429—40.2 per cent. A total of 3969 cases with 1509 deaths, a mortality of 38.01 per cent. In the first decade, when in all probability the patients were bled freely, the mortality was higher than at any other period, although the difference is not great.

From the Pennsylvania Hospital we obtain the following figures: 1845, '46, '47—16 per cent. 1855, '56, '57—25.4 per cent. 1865, '66, '67—24.1 per cent. 1875, '76, '77—39.2 per cent. 1885, '86, '87—36.1 per cent. The increase from 1845, '46, '47, 16 per cent. to 36 per cent. in 1885, '86, '87, tallies with Dr. Hartshorne's statement that the death-rate has more than doubled, but if we compare the other years in the same decades we see the dangers of figures. For in 1848, '49, '50—37.9 per cent. 1858, '59, '60—21.2 per cent. 1868, '69, '70—22.8 per cent. 1878, '79, '80—32.7 per cent. We see that the mortality in 1848, '49, '50, when the older methods of treat-

ment were certainly in vogue, was very high, the highest almost in the history of the institution.

The total mortality in 704 cases is about 29 per cent.

The death-rate in the Edinburgh Infirmary is strikingly opposed to Dr. Hartshorne's views. In the period before 1848, prior to the introduction of more rational methods of treatment by Bennett, the mortality in 567 cases was 205, or 36.3 per cent. To 1856 in 611 cases 131 died, or 21.2 per cent.; while from 1856 of 548 cases only 71 died, or 12.7 per cent.

One important reason of the increased death-rate in this country is the increase of the classes in which pneumonia is particularly fatal—the paupers and drunkards.

I would add that could we have statistics from private practice, the tale would be different. Dr. Howard, of Montreal, reported to the Canadian Medical Association 170 cases with a mortality of 6 per cent. The cases were, I believe, treated without bleeding and under what was practically the rational method. The difference between this and the mortality at the general hospital of the same city (20 per cent.) is marked.

Dr. J. H. Musser said: I have been looking over the available notes of my own cases in private pactice. The total number of cases treated was 49, and of these 23 were over eighteen years of age, 5 of the 23 were the subjects of cardiac disease or Bright's disease and they all died. Of the remaining 18 cases, 2 died. Both of these were adult males between the ages of twenty and thirty years. Many of the cases that lived were over forty years of age. The usual treatment that I have pursued has been the modern method with use of dry cups locally and hot-water bags to the thorax. Small doses of quinine with the use of ammonia and alcohol, when indicated, were exhibited. In the 26 cases under eighteen years of age, there were no deaths. In many of these cases stimulants were exhibited freely.

Dr. Hartshorne said: I have been greatly interested in the additional statistics given by Dr. Osler. The earlier

statistics from the Pennsylvania Hospital are particularly interesting. Those of 1830 and earlier belong to a period of excessive bloodletting. There is no need to call it anything else. As I have said in my paper, the practice of Bouillaud, Chomel, Grisolle, and Rasori, was terribly destructive. They bled over and over again; twenty or thirty ounces to-day and the same amount to-morrow. The reaction from this has led to the general abandonment of bloodletting.

It is impossible to decide such a question as this in regard to private practice by statistics, as there is so little material available. My own belief, in the absence of statistics, is that the number of deaths in private practice from pneumonia, especially in persons in good health and of a vigorous constitution under sixty years of age, has greatly increased in the last ten or fifteen years, over what it was thirty or forty years ago. It was this impression that led me to take a strong interest in this inquiry. My conviction is, as I have already stated, that the question is really between doing nothing at all, and adopting the more moderate practice of forty years ago.

It is obvious that the character of the patients in hospitals has an important influence upon the mortality. I have, in my paper, taken the statistics of hospitals simply from necessity, owing to the absence of any others. Such statistics give the worst results in this as in other diseases.

THE INDUCTION BALANCE AND THE TELEPHONIC PROBE.

By

JOHN H. GIRDNER, M.D.

[Exhibited by invitation, February 1, 1888]

Mr. President and Gentlemen: I thank you very much for the honor of being invited to appear before you, and I shall at once begin the explanation of the instruments which I have to show you. I shall not say anything in regard to gunshot wounds in general. I will merely say that in my efforts to bring the two instruments to the state of perfection that they have reached at present, I have worked with the hope that I might be enabled to improve our statistics in gunshot wounds of the brain. During a year's clinical work, I have used the instruments in a great many cases, and have been successful in a number.

I shall first describe in a few words the induction balance, and shall then explain the telephonic probe. It may be well to say that the induction balance requires the use of a battery. We take our electricity from a battery; but in using the telephonic probe we take the electricity from the body of the patient. For the induction balance I usually use a Flemming battery of about six cells. An interrupted current is necessary, and

about six hundred interruptions per second give the best results. The wire from the positive pole of the battery terminates in a coil consisting of fine insulated copper wire wound on a spool of cardboard. The wire coming from the centre of the coil is connected with the negative pole We next take a second coil similar to the first, the ends of the wires of the second coil terminating in a telephone receiver. This coil is laid over the first; and this is the essential construction of the induction balance. When a current of electricity is passed through the first coil, it induces a current in the second circuit. For convenience, I call these the primary and secondary currents. It is a law of electricity that an induced current is always stronger than the current which induces it. By moving the second coil about on the surface of the first coil, there will be found a position for it where there is no longer any buzzing noise in the telephone, but perfect silence, and it is then we have a perfect balance established; the difference between the induced and primary current is then overcome. Having obtained this balance, if any metallic body is brought into the neighborhood of the ellipse formed by the overlapping of the two coils, the balance is destroyed and a buzzing sound is produced in the telephone. When the centre of the ellipse approaches the metallic body, the sound is the loudest. In order so to arrange this that the coils may be brought toward the metallic body, I place the first coil in this block of wood. The second coil is placed over it, and while the telephone is applied to the ear, the second coil is moved about until a position on the first is found where there is silence in the telephone. Melted paraffine is then poured around them and allowed to harden. It is very difficult to make

these explorers. The maker tells me that half of them are ruined by the disturbance caused by pouring in the paraffine. I at first had trouble from the atmospheric changes affecting the wood. When the air was humid the wood would swell and destroy the balance. I have overcome this by using different kinds of wood in the explorer with the grain running in opposite directions. After the balance is established, I place a piece of plush over the explorer, in order to make a soft surface for application to the patient.

We know that it is not always necessary to remove a bullet when it is situated in muscular tissue, but in the brain it is very important that the bullet should be removed. Suppose a bullet has entered the brain. By shaving the head and exploring with the balance, we shall find a point where a sound is heard in the telephone and when the sound is heard the loudest we know that the centre of the ellipse corresponds with the position of the bullet. That indicates the point at which the trephine should be applied, and you then come upon the ball as I have done in a number of instances. I want to say, however, that the distance at which a ball will disturb the balance is limited. With a good instrument and a quiet room, a 32-calibre ball can be detected at a distance of one and a half inches from the surface. If you are not able to find a spot where a sound is heard, you may be certain that the ball is located so deep that it cannot disturb the balance, so that if you do not find where the ball is, you find where it is not.

Now I have here an instrument which is not limited, and it is one in which I think that you will be interested. This is the telephonic probe. It consists of two small

telephones attached to this light steel band in such a way that they are kept in contact with the ears. One telephone is sufficient; the use of two is rather a refinement. The two are joined by a wire so that they are both thus placed in the same circuit. The internal construction of these telephones is as follows: There is a bar of soft iron, around which is wound insulated wire. In front of the bar of soft iron a metal diaphragm is suspended which does not quite touch the bar, and these two wires are a continuation of the coil which surrounds the iron bar. If these wires are attached to a battery and a current is passed, every time that the current is made and broken the diaphragm vibrates, clicking backward and forward. Here, at the end of one wire, I have a small hollow steel bulb attached, and at the end of the other an ordinary handle with a steel probe in it. One wire is attached to the bulb and the other is connected with the probe. If the bulb is placed in the patient's mouth, and the probe directed in the track of the bullet, so soon as we touch the bullet a current of electricity is generated, and passing through the wire converts the soft iron bar into a magnet, drawing the diaphragm toward it. When the contact is broken, the iron ceases to be a magnet and lets the diaphragm go, and thus, every time the contact is made and broken a clicking sound is heard in the receiver. We make a battery of the patient's body. The steel bulb corresponds to one element of an ordinary battery while the bullet constitutes the other element. The chemical processes going on in the body around these metals are sufficient to produce a current. I now place the bulb in this man's mouth, and in his moistened hand I place a piece of lead and a piece of bone. When you probe

the lead a current is obtained and a sound produced in the telephone, but on touching the bone no sound will be heard.

In using the induction balance it is important that all metal should be removed from the person and from the neighborhood in which the experiment is tried. Even the nails in an ordinary table will disturb the balance.

A CONTRIBUTION

TO

THE STUDY OF FRIEDREICH'S ATAXIA.

WITH EXHIBITION OF CASES.

By

J. P. CROZER GRIFFITH, M.D.,

ASSISTANT PHYSICIAN TO THE HOSPITAL OF THE UNIVERSITY OF PENNSYLVANIA: PATHOLOGIST TO THE PRESBYTERIAN HOSPITAL.

[Read February 1, 1888.]

No better commencement of this subject can perhaps be made than by repeating the oft-quoted definition formulated by Friedreich himself, as follows: "There exists a chronic inflammatory degeneration of the spinal cord leading to atrophy, and which seems especially liable to develop at puberty under the influence of an hereditary predisposition. It is chiefly confined to the posterior columns, and, beginning in the lumbar part of the cord and spreading in both an upward and downward direction, it finds its limits in the medulla, after involving the centres and trunks of the hypoglossal nerves. The affection is characterized clinically by a disturbance of the coördination and harmony of the bodily movements, which develops very gradually, advances from the lower to the upper portion of the body, and at last invariably involves the organs of speech; though there is no disturbance of sensibility, and the special senses and cere-

bral functions remain intact. There are neither paralyses of the sphincters nor trophic affections. Less constantly there appear curvature of the vertebral column, vertigo, and nystagmus. From a clinical point of view the disease may be regarded as a chronic progressive paralysis of the power of combination of movements; and from the standpoint of pathological anatomy, as a chronic degeneration of the posterior columns of the spinal cord."

This definition still holds good in part, though in the light of the cases which have been reported since it was given, it must undergo certain modifications. The following, based upon it, will perhaps better accord with our present knowledge of the affection: Friedreich's ataxia is a chronic systemic inflammatory degeneration of the spinal cord, developing usually in infancy or childhood, and occurring in cases in which there has probably been an arrest of development of the cord during fœtal life, this being the result of some hereditary predisposition. It is situated chiefly in the posterior columns, the lateral pyramidal tracts, the direct cerebellar tracts, and the columns of Clarke, though other parts of the white and gray matter are very commonly somewhat affected, and the sclerosis extends slightly into the medulla. The affection is characterized clinically by a disturbance of the coördination of the bodily movements, developing gradually, advancing from below upward, and finally involving the organs of speech. Curvature of the spine, talipes, vertigo, and nystagmus are frequent. The patellar reflex is nearly always abolished. Paralysis and sensory disturbances are not uncommon in advanced cases. Trophic, vaso-motor, and visceral affections are unusual, and any involvement of the intellect is probably accidental.

In the course of some studies on this disease I found so many omissions in and discrepancies between the tabulated lists of cases made by various authors, and so many new cases in the literature, that I have investigated for myself all the reports of instances of the disease, so far as I have been able to learn of any. To render the results as accurate as possible, the original publications have been consulted in every instance but three; these being the article of Erlenmeyer, of which, however, a literal translation was found; that of Jakubowitsch, an abstract of which was seen in one of the German journals, and that of Palma, whose case is nevertheless detailed in full by Vizioli. Personal communication with Drs. J. J. Putnam, G. B. Shattuck, W. B. Gowers, W. Everett Smith, W. C. Warren, and Morton Prince has aided me greatly, and I take this opportunity to express my thanks to these gentlemen for their kind and valuable assistance.

I desire to offer to the College a new tabular arrangement of cases, with their most important symptoms. Table I. contains 143 cases,[1] comprising all those from

[1] Through an oversight, the case of C. L. Dana, and that of V. P. Gibney (New York Med. Record, Oct. 1, 1887, p. 465) were omitted. The important features of these cases are as follows:

Case 144.—Dana's; male; aged nineteen. Father probably alcoholic; no other case in family. Ataxia of gait and speech, and constant thirst, appeared at seventeen years. Examination showed marked ataxia of gait; Romberg's symptom; some ataxia of arms; slight oscillation of head; slight paralysis; slight curvature of spine; slight talipes equinus; knee-jerk normal; no atrophy; hands cold and red; no pain; slight anæsthesia; slight diminution of muscle sense; legs sometimes numb; speech slow, thick, and scanning; almost imperceptible nystagmus; apparently beginning optic atrophy; sometimes vertigo; polyuria.

Case 145.—Gibney's; male; aged seventeen to twenty years. Disease known to have existed at six to nine years; ataxia of gait very marked; speech ataxic; no pain; no cause of disease known.

the literature appearing to have any just claim to be considered probable instances of Friedreich's ataxia, and including those exhibited to-night by Dr. Sinkler, Dr. Osler, and myself. Objections might with propriety be urged against some of the number, but it is not the purpose of this paper to assume the right of discrimination beyond that which is absolutely necessary, but simply to collect and analyze the cases as an aid to future study. To Table II. (Additional List) are relegated: A. *Reputed cases*, containing all those reported and related by blood to those in Table I., but which have not themselves come under professional observation. B. *Possible or probable cases*, merely referred to and without published descriptions, so far as I have been able to ascertain. C. "*Too doubtful cases*," as they might be named, claimed by the observer or by critics to be instances of the disease, but which differ so widely from its complex of symptoms that it seemed almost certain that the general consensus of medical opinion would reject them.

I beg leave this evening to exhibit to the College three cases of Friedreich's ataxia, all of them inmates of the Home for Incurables and Cancer Hospital, of this city, where I have repeatedly examined them during my terms of service. For their presence here to-night I am indebted to the courtesy of my colleague, Dr. Horace G. Hill.

Case I.—Sadie T., aged twenty-three; single. Father and mother living and well; maternal grandmother died of apoplexy; no history of any nervous disease in family. There were 7 children, of whom 1 died of measles, 1 of some febrile affection; 1 brother and 2 sisters are well, and 1 brother (George) suffers from this same disease.

The history obtained from the mother and the patient herself is as follows:

She was well and active until about ten years of age, at which time the mother noticed that the child "was nervous." Her hands shook while eating, and her gait was somewhat unsteady and staggering, though she did not often fall. The mother, who is an intelligent woman, is positive in the statement that the disease did not resemble chorea, of which she had seen instances. On account of the nervous affection she was entered, a few months later, at the Children's Hospital of this city, and soon after passed through a severe attack of typhoid fever, followed very soon by measles. After recovery the nervous affection was found to be much worse, and the patient was unable to walk without crutches; and, even after strength returned to other parts, the legs remained weak. The affection of the upper extremities had not meantime grown worse, and was but slight. The patient complained at this time of a sense of burning in the feet and aching in the legs, but there is no history of true lightning pains. Sensibility in the legs to touch and to pain appears to have been undisturbed, for the mother used frequently to test it herself with the point of a pin, and could perceive no alteration. The patient walked with crutches until the age of sixteen, was able to go upstairs on the hands and knees, and to rise from the floor by grasping the furniture; yet the disease had been constantly progressing in the lower extremities.

In November, 1880, at the age of sixteen, she was examined at the Infirmary for Nervous Diseases, of Philadelphia, and the following note entered in the case-book: "She can feel perfectly. No tendon reflex. Adduction of thighs very weak, but the patient can make all movements of feet and legs, but is utterly unable to stand. Patient stout and of a good color. When on back, on attempting to lift legs, they fall outward. There is some choreic movement of the hands." She entered the Home for Incurables December 29, 1880, being still able to

walk with crutches, though with difficulty. The incoördination of the hands now grew worse. She rapidly lost the power to walk at all, and her speech became affected. It was impossible for her to sit upright, and a brace was made for her. Her mother says that her intellect has remained unaffected.

Present condition, August 16, 1887: The patient is of average size, and of a bright and intelligent expression. She sits during the day in a wheel-chair, which she is able to propel. She cannot sit erect, but slouches down in the chair, and holds her head far forward. There is some scoliosis to the right in the dorsal region. She is unable to walk or stand, or, indeed, barely to move the legs at all; nor can she raise herself from a recumbent to a sitting position while on the bed. Both feet are in a position of slight equino-valgus, but there are no other contractures. The muscles, both of the thighs and legs, are firm, and there is no more atrophy than would naturally follow lack of use. The patellar reflex is abolished. The grip of the hands is good; that of the left being somewhat better than that of the right hand. In grasping an object the fingers and hands are extended over it like a claw. The fingers are held rather flexed, and the patient is unable to extend those of the right hand very well, though there is no resistance to passive motion. There is no motion or tremor of the hands when in repose, but on voluntary effort a slow ataxic movement of the fingers develops, somewhat resembling athetosis. She picks up a pin with the greatest difficulty, and with marked incoördination, using the whole finger and not the tip, much as an infant would. She cannot cut her own food, but can feed herself. She can scarcely touch the tip of the nose with the finger, but this difficulty is not definitely increased when the eyes are shut. The muscles of the arms are perfectly well developed, and there is apparently no diminution in strength. The handwriting is almost illegible. During the effort to write, or under other excitement, the head develops irregular lateral oscillatory movements; and a slight jerking motion is almost constantly present when speaking, though there is no true tremor. The tongue is extended steadily. The speech is peculiar, somewhat

jerking, but not scanning; several words being spoken rapidly, then a brief pause ensuing, followed by another series of words, the pause sometimes occurring between syllables. The pupillary reflexes are normal. There is very slight and inconstant nystagmus on extreme lateral movement. The result of the ophthalmoscopic examination of the eye-ground, kindly made for me by Dr. Charles S. Turnbull, was entirely negative. The functions of the bladder and rectum are normal, though the urine is alkaline, albuminous, and contains numerous leucocytes. There is no affection of the thoracic and abdominal viscera, and menstruation is regular. There are no marked disturbances of sensation. The head and point of a pin are differentiated perfectly, both on the upper and lower extremities. The points of the æsthesiometer are recognized at six centimetres on the extensor surface of the legs, at four centimetres on the forearm, and at about one-half centimetre on the tip of the third finger. The sensibility to pain and to temperature is unaffected. There are no pains in the legs, but a girdle sensation is sometimes perceived. Owing to the slowness in speaking, it is uncertain whether any retardation of the conduction of sensation exists, though it seems probable. No electrical examination was made.

The history of the next case is most interesting, and, I believe, in certain respects, unique. It would seem as though some other nervous affection, perhaps neuritis or anterior poliomyelitis, had preceded the onset of Friedreich's ataxia by about eight years, and that the atrophy of the left leg is probably to be attributed to it.

Case II.—George T., aged twenty-one, brother of last patient. The mother relates that he was well as a child, but had a fall from a high step when two years old and hurt his left hip, though he soon recovered, and no traces of injury remained as far as could be detected. Soon after this he got his feet wet while wading, and on the same evening developed a

high fever, which disappeared the next day, but left him with feet and legs very much swollen as far as the hips, and entirely unable to stand. He was taken to see Dr. G. W. Norris, who pronounced it paralysis; and again, a few days later, to Dr. S. D. Gross, who gave the same opinion, but was not sure whether it was due to the fall or to taking cold. After one to two weeks the swelling began to disappear, and the child commenced to creep, and a few weeks later to walk. The right limb now appeared to be perfectly normal, but the left was weaker and decidedly wasted, and a brace was fitted to it. Slow improvement followed, and after two or three years the brace was replaced by a stiffened shoe. At the age of eight years he "threw" the left lower limb when he walked, and both leg and thigh exhibited considerable wasting; but the mother says that sensation to a pin-prick seemed entirely unaffected. She had further never noticed any affection of the hands, nor any other disturbance of the gait except that described. At nine years of age (in 1875) he was severely sick with measles, followed by pneumonia. On recovery it was found that he had lost the power of his lower limbs, and had difficulty in sitting erect. Curvature of the spine soon developed, but the upper extremities remained uninvolved; and after four months he was able to walk with the aid of some one or with crutches. He then learned to walk from one article of furniture to another rapidly, much as an infant would; but slow locomotion was accompanied by much swaying and frequent falls, from which he was able to rise again by putting his hands on his knees, or by grasping objects in the room. Improvement was very slow, if indeed there was any; and in November, 1884, at the age of fourteen, he was admitted to the Infirmary for Nervous Diseases, where the Achilles tendon of the left foot and some other tendon of the right foot were cut. After three months' treatment he was fitted with a brace for the left leg, reaching up to the waist, and with a short one for the right leg; walking tolerably well with the aid of these and of a crutch. He says the doctors at the Infirmary used to remark that it was strange he could not use his right leg better, as it was so well devel-

oped. He was admitted to the Home for Incurables in 1884, at the age of eighteen, and could still walk with crutches. Since admission his hands have become unsteady, and he is no longer able to sit erect without support, or to walk. The date at which the affection of speech began is uncertain. He has never had lightning pains or girdle sensation, though he sometimes experiences painless spasm of the extensors of the right leg at night.

Present condition, August, 1887: The patient, of average size, has a good color and general nutrition. He sits through the day in a wheel-chair, in the same unnatural position as his sister, though to a less degree. The lower extremities are rather cold and red. The muscles of the right leg and thigh are quite firm, and there is no marked wasting. He can flex the thigh on the trunk with some difficulty, and partially extend the leg, but the muscular power is decidedly diminished. The left lower extremity is very greatly wasted, the patient being barely able to move it at all. There is no knee-jerk on either side. The spinal column shows a marked scoliosis to the right in the dorsal region, and the patient cannot raise himself upright in his chair without the aid of his hands. The muscles of the arms are unusually large and well developed, and the grip is powerful. When in repose the hands lie quietly in the lap, but voluntary movements are executed with marked incoördination, which is not notably increased on closing the eyes. The patient buttons his clothes with difficulty, and is unable to bring the forefinger tips together or to touch the ear or nose with accuracy. He can feed and dress himself, and write, but the handwriting is very unsteady. There is occasionally a slight ataxic movement of the head, though the tongue is extended without tremor; the speech is a little jerking. There is slight ataxic nystagmus on lateral motion; the pupilary reflexes are normal. An ophthalmoscopic examination by Dr. Turnbull revealed no alteration of the eye-ground. The thoracic and abdominal organs appear to be normal. There is no pain; no girdle sensation; no affection of the bladder or rectum. There is retardation of the conduction of sensation

in the right leg, with slight diminution of tactile sensibility on the outer surface, but not over the anterior portion of the tibia. No positive sensory changes can be detected in the left leg. In the hands and arms there is evidently a diminution in the power to distinguish the point from the head of the pin, and the æsthesiometer points are recognized on the dorsum of the right hand at four centimetres and on that of the left hand at six centimetres. The muscle sense is decidedly involved in the lower extremities, as the patient cannot clearly define the position of his feet when his eyes are shut.

Case III.—Annie C., aged twenty-six years. The parents are living and well, and no history of any nervous disease in the ancestors can be elicited. Of 10 children, 2 died in infancy, 6 are in good health, and 1, a son, died of "weakness" at the age of nine years, having developed, after scarlet fever, the same unsteady gait as Annie at one time exhibited. She was well until five years of age, when she had scarlet fever, though not in a severe form, and without complications. She seemed, however, after recovery, to be very weak in the legs; had a swaying, somewhat staggering gait, with frequent falls, and could not run upstairs. When eight years old she wore, for a year, braces on both legs, extending to the hips. She went to school till twelve, but walking then grew so much worse that she was obliged to lean on her sister for support, and soon to leave school altogether, and she began the use of crutches. Weakness in the legs progressed, and at sixteen she could no longer walk at all. At twenty she was an inmate of the Jefferson College Hospital, where she received electrical treatment, but without benefit. When about twenty-two years old she first began to notice weakness in the arms, but she does not remember when the difficulty in sitting erect or in speaking began. She says that at times she cannot talk as fast as she wishes, and that she sometimes chokes when swallowing liquids; and I have myself once seen her in a severe attack of choking from swallowing saliva. She does not suffer from headache or

other pain, but complains often of cold feet. The left leg is sometimes drawn up spasmodically at night.

Present condition, August, 1887: The patient is of average size, for the most part well nourished, and of a slightly apathetic expression. Her position in sitting is like that of Case I. There is some scoliosis in the dorsal region. The feet are shorter than natural, with some talipes equino-valgus, and with some contraction of the flexors of all except the great toes. There is but very slight atrophy of the muscles of the lower extremities. She is not able to extend the legs at all, and can flex the thighs but very little. The knee-jerk is abolished on both sides. The hands are rather claw-shaped, with the proximal phalanges partially extended on the dorsum of the hand, and the remaining ones flexed; but the patient can straighten them at will, and there is no resistance to passive motion. The ataxia of the upper extremities is very great, and she is scarcely able to pick up a pin, or with the eyes closed to bring the forefingers together, or to touch the ear or nose. With the eyes opened this incoördination is very little, if any, less, but when in repose the hands remain quiet. The arms are somewhat wasted; the grip fairly good, but rather infantile, small objects being grasped with the radial side of the index finger and the thumb. The head exhibits slight irregular swaying and nodding movements, intensified when talking or under excitement. The tongue is extended with a slight trembling motion, and speech is slow and scanning. There is slight lateral nystagmus on extreme lateral movement of the eye; the pupillary reflexes are normal; and Dr. Turnbull reports ischæmia of the retina and venous pulsation in both eyes, but no other alteration of the eye-grounds. The intellect is entirely unaffected; the functions of the bladder and rectum are normal, and there is no disturbance of menstruation. Physical examination of the abdominal and thoracic organs reveals no change in them. There are no lightning or other pains, and no girdle sensation. The tactile sensibility of the legs is evidently diminished, although the head and point of a pin are differentiated quite well. She is unable to feel the two points of the æsthesiometer

at a distance of ten centimetres on the forearm, and on the dorsum of the hand their recognition is very uncertain, but she can nearly always distinguish the point and the head of a pin. The slowness of speech renders it difficult to determine whether the conduction of sensation is retarded.

The cases of Dr. W. C. Warren, of Waterford, Mississippi, referred to by Dr. Hammond in the *Journal of Nervous and Mental Diseases* for 1882, are so briefly reported there that I have written the observer for further particulars concerning them, which he has kindly sent me, with permission to publish the history of the cases up to date, including the account of a fourth patient in the same family.

Family history: The paternal grandmother is still living, but has been paraplegic for over thirty years. The father is healthy, but of a very excitable disposition. With these exceptions there is no nervous disease in the family, and no known history of tuberculosis, alcoholism, or syphilis. There are 9 children, 4 of them the patients to be described. The disease affected the 1st, 4th, 5th, and 8th children; the others being healthy and well developed.

Case I.—Nannie W.; aged twenty-nine; was healthy up to the age of eight years, when the parents noticed that she staggered when first rising in the morning, and could only stand steadily after balancing for some time with extended arms. After a little exercise the unsteadiness would disappear, but as time elapsed it grew constant, the gait being oscillating from side to side, and the feet striking the floor with considerable force. At about the age of twelve curvature of the spine was noticed and the arms became involved. At thirteen she had a severe attack of bilious remittent fever, to which affection she was subject, and has never been able to walk since. The motions of the arms also grew very incoördinate and of a chorei-

form nature, and the patient was unable to button her clothes or to touch the tip of her nose with her index finger with the eyes shut. Talipes was noted at an early period. There had been only slight pain, between the foot and knee. At twenty-one the affection of speech began, and has advanced to an extreme degree. Up to the age of twenty-three the patient was able to extend her hand in salutation, though with difficulty, while the arm oscillated involuntarily up and down and from side to side several times before the hand of a friend could be grasped. For the last two years she has been entirely helpless. Menstruation began at twelve to thirteen, and has continued regular. The patient complains of vertigo, and suffers from some incontinence of urine, while at times there are involuntary painless spasms of the right leg, occurring chiefly at night.

Present condition: She lies curled up in bed with the knees nearly touching the chin. There is marked curvature of the spine (lordosis). Intelligence at first appears deficient, but careful examination shows the diminution to be slight, as far as it is possible to judge in the presence of the great affection of speech. For a few months she has been almost constantly crying without any known cause. She is able to read ordinary print for hours, but sometimes vision fails, and the type seems blurred, though no ophthalmoscopic examination has ever been made. There is no nystagmus. Speech is nearly unintelligible, even to the parents, and there is slight trembling of the tongue. The arms are almost powerless, and are held flexed, as are the hands and fingers; and there is marked atrophy of the muscles, especially of the extensors. The legs are also very helpless; the muscles wasted, particularly the extensors; talipes equinus is present; the knee-jerk absent. There is no girdle sensation, and at present no pain. Cutaneous sensibility is about normal. The electrical reactions were not tested, but three years ago the faradic contractility was exaggerated. The surface of the body is cold; the pulse persistently rapid and small.

Case II.—Thomas W.; aged seventeen; fourth child; healthy till eight years of age, when the disease began in exactly the

same way as in the case of the sister,—*i. e.*, with unsteadiness when arising from bed. The gait became more and more oscillating and uncertain, and the feet struck the floor with force. Finally, at fifteen, walking without assistance was no longer possible. At twelve the arms became involved, and at fifteen very great incoördination with choreiform movements had developed. The speech has quite recently become affected. There has been at times slight pain between the foot and knee, as in the sister's case. More recently there has been pain in the region of the dorsal spine.

Present condition: The intellect is unaffected; there is no vertigo; vision is good; no nystagmus; speech slightly slow and hoarse; no trembling of the tongue; head held steadily; no ataxic movements of the trunk; decided scoliosis in the dorsal region. The hands and arms exhibit marked incoördination, and the patient cannot button his clothes, and touches the tip of the nose with the index finger with difficulty. These and all motions become much more ataxic when the eyes are closed. Station is swaying, and the patient has a tendency to pitch forward. On closing the eyes the oscillation increases very greatly, and he falls unless holding to some support. The muscles in general are somewhat atrophied, and there is some loss of power. Knee-jerk is lost; talipes equinus of both feet is present; there is a slight tendency to spasmodic contractions of the legs at night. Cutaneous sensibility is normal; there is no girdle sensation, and no affection of the bladder or rectum. The surface of the body is cold, and the circulation feeble.

Case III.—Robert W.; aged fifteen; fifth child. The disease in this case also began when the patient was eight years of age, and with the same staggering when first rising in the morning. The oscillation in walking progressed; the arms became involved at twelve years of age; the speech is still unaffected. Some pain in the legs below the knees, and a sense of weakness in the back is complained of.

Present condition: Intelligence good; there is decided vertigo;

the vision is good; no nystagmus; no ophthalmoscopic examination has been made. The speech is unaffected, and there is no trembling of the tongue. The head does not oscillate; the movement of the arms is very ataxic and of a somewhat choreiform nature, and buttoning of the clothes is impossible; while incoördination is increased on closing the eyes. There are no ataxic movements of the trunk. Scoliosis in the dorsal region is present. The gait is oscillating, staggering, only possible when the patient supports himself by the furniture or uses a cane. The station is swaying, and becomes impossible when the eyes are shut. Talipes equinus is present. There is no patellar reflex. Decided atrophy of the muscles is observed in the upper and lower extremities, and there is a certain amount of paralysis. The cutaneous sensibility is unaffected. There is no girdle sensation, and no affection of the bladder or rectum. The surface of the body is cold and the circulation poor.

Case IV.—Nettie W.; aged eight; eighth child; is just beginning to show symptoms of the disease. She was always healthy, but since the age of six years it has been noticed that she staggers when rising in the morning, and only after some effort, and by repeated placing of the feet on the floor and balancing with the arms outstretched, can she succeed in preserving her equilibrium. After a little exercise the ataxia of station disappears. There is no affection of speech; no nystagmus; no curvature of the spine; no paralysis. The knee-jerk is diminished in both legs.

To study the characteristics of Friedreich's ataxia more in detail, the subject may conveniently be divided under the following headings:

History.

The first cases, 6 in number, were reported by Friedreich in 1861 before the Thirty-second Congress of Ger-

man Naturalists and Physicians, held at Spiel, but they were not published in full until 1863. In 1865[1] Carre described a case in his monograph on Tabes dorsalis. From 1872 to 1876, inclusive, 6 cases were reported in England by Bradbury, Carpenter, and Dreschfeld, and 2 in America by Kellogg; and in 1876 Friedreich published his last set, thus making 20 instances in the literature, including the 2 of Quincke quoted by Friedreich, but which, for the sake of convenience, are tabulated later, since Rütimeyer has described them more fully. By the end of 1880 the number had increased to 31; with the close of 1882 to 47; with the beginning of 1885 to 71; and now reaches 143. There have appeared several valuable critical reviews, with or without reports of cases, as, for example, those of Féré, Möbius, Cuche, Ormerod, Bury, Sepilli, Vizioli, and others. I would here especially acknowledge my indebtedness to those of Ormerod, Vizioli, and Bury, of which I have made free use.

Name.

Friedreich first described the disorder as "Degenerative atrophy of the posterior spinal column," but this title quite fails properly to distinguish it. The name "Friedreich's disease," favored by Brousse and probably by most writers, though at one time perhaps the best, has recently become very objectionable, since paramyoclonus multiplex is frequently spoken of under the same title. "Congenital ataxia," as employed by Mastin, may lead to misapprehension, since, though it is

[1] This is the date given in the reference in Friedreich's paper, and also that of the copy of Carre's work which I consulted, and which there is no reason to suppose was other than a first edition, though the usual date assigned by authors is 1862.

probable that the affection is congenital, it has not been proved so. "Hereditary ataxia" as it was called by Friedreich, is in few cases a proper appellation, for reasons which will be explained later. "Family ataxia," suggested by Féré, is a less objectionable name than the preceding, since all the 143 cases have occurred in but 77 families of brothers and sisters. 2 sets of Musso's cases were related as cousins, as were 4 sets of Rütimeyer's; while 2 of Vizioli's patients and 4 of Smith's were children of ataxics. The number is thus reduced by 6, making 71 entirely unrelated families. Yet it is to be noted that the disease does not always occur in several brothers and sisters, since there have been 39 instances in which but 1 ataxic child was *seen by a physician* in the family, and of 24 of these it is stated that the patient was the only child affected by the malady. It becomes evident, therefore, that this title is inapplicable, though in 4 of the 24 cases (99, 107, 111, 116) the patients were the oldest children, and others may consequently have developed the symptoms of the disease later; while in Cases 56 and 122 the patient was the only child, and in 30, 117, 118, and 127 the existence of other children is not mentioned. Smith proposes the name "Postero-lateral spinal sclerosis (generic origin)," or short, "Generic ataxia." The full title describes the pathological changes, but does not distinguish it from Ataxia paraplegia of Gowers—the Combined postero-lateral sclerosis which is so ably discussed by Westphal; while the term "generic" is open to the same objection which applies to "hereditary" and "family"; viz., that it is not always applicable, and describes as characteristic and even indispensable that which is by no means such. A still better title is, I

think, "Friedreich's Ataxia," which designates the most prominent characteristic, gives the disease a specific name, and does not impose any limitations to be violated. Though not preferring the use of a writer's name for this purpose, I cannot but think that in the present state of our knowledge this is the best title that can be chosen.

Etiology.

Heredity.—Friedreich's ataxia is essentially one of the hereditary diseases, but the adjective must be understood here in its broadest sense.

A. *Direct and similar inheritance—i. e.*, inheritance of the disease itself or of some form of ataxia—has occurred in only 33 cases in 16 families of brothers and sisters; some of which, however, are very doubtful examples of it. Some of the cases of Ormerod (66, 70), those of Musso, and the Blattner family of Rütimeyer had respectively the grandfather, great-uncle, and great-great-great-grandfather reputedly ataxic. Descended from the last mentioned, who went by the name of "Stulzi" (the stumbler), were 8 instances of Friedreich's ataxia (2 in Table II. A) in 4 families. The grandfather of 2 of Bury's patients (112, 113) had probably an ataxic gait. In Bradbury's, Brousse's, and Carre's cases the mothers are spoken of as ataxic, and in the last there were in addition 6 brothers and sisters of the patient, 8 of the mother, the grandmother, and a cousin, who were said to have the same disease. The father of Fowler's cases was reported to have a peculiar gait; 2 uncles of Mastin's patients were almost certainly subjects of Friedreich's ataxia; and the father as well as the brother were without doubt affected by the same symptoms as

Botkin's case exhibited. But in no instance were the reported ataxic parents actually under medical observation except in the case of Smith, and in 2 of those of Vizioli; and here a direct inheritance of Friedreich's ataxia appears to have been witnessed. The father (100) of Smith's patients (101, 104) became ataxic after the age of sixty-six, while the 2 cases of Vizioli referred to are especially interesting. Vincenzo Vitielli (81), namely, was the father of Antonio and Luigi (89, 90), and the table also contains a cousin (91) and 7 uncles and aunts of these boys who were subjects of Friedreich's ataxia. A sister of 91 is to be found in Table II. A. It is interesting to note that there are sometimes instances of crossed heredity—*e. g.*, among Musso's patients there were 3 females inheriting the disease through the male line; and 3 males (2 in Table I. A) through the female line; while in Mastin's cases, again, 3 males inherited it through the female line.

B. *Polymorphic inheritance*—as seen in the development of a nervous disease in the children of parents affected by some other neurosis—is of frequent occurrence, and even the simple constitutional degeneration of the antecedents from various causes may account for the production of Friedreich's ataxia or other disorders in the descendants. Under this broad definition of heredity in nervous affections as emphasized by Möbius there exist as possible additional ancestral predisposing causes of Friedreich's ataxia: 1. Other Neuropathies, or exceedingly nervous disposition in the parents, grandparents, uncles, or aunts. 2. Alcoholism. 3. Tuberculosis. 4. Syphilis. 5. Consanguinity. 6. Other unclassified causes.

1. *Neuropathies* of various kinds, including great

nervousness, have been reported present in the parents or the relatives mentioned in 58 cases. In the remainder there were either none discovered or no reference is made to the matter. In 25 of the 58 cases one or both of the parents (marked + in the table) alone suffered from nervous symptoms; in 23 (marked ±), grandparents, uncles or aunts were also nervously affected; and in 10 (marked —) only the latter (*i. e.*, excluding parents) were neuropathic.

2. *Intemperance* of the ancestors[1] is a feature to which considerable importance was attached by Friedreich, who found it present in 6 of his 9 cases. In the Süss family, indeed, the mother maintained that her children were conceived while the father was intoxicated. I find intemperance of the father—and in Mastin's cases, of the mother also—in 31 instances (marked + in the table) occurring in 10 families; while in 13 other cases (marked —) the parents were sober, but the grandparents or other parental relatives had been intemperate. In some of the remaining 98 cases it is stated that there was no intemperance in the family, but in most of them the subject is not referred to, and it is fair to presume that the habit was absent in a large number. In only 7 instances (1, 2, 20, 21, 74, 75, 134) could it be said to be the only hereditary predisposing cause detected, and intemperance is unfortunately so common that it may have been here a pure coincidence. Though it seems to be not without some influence, I think but comparatively little importance can be attached to it.

3. *Tuberculosis* of the parents only was noted in 9 cases (marked +). In Palma's case the mother was

[1] The term "ancestors" in this paper denotes parents, grandparents, uncles, and aunts.

consumptive and sprang from a very consumptive family, and in one of Bury's (114) both father and uncle died of the disease. In 10 instances (marked —), including the 3 cases of Freyer where tuberculosis had probably existed, grandparents, uncles, or aunts had died of the affection. In 21 cases, therefore, all told, tuberculosis was present in the ancestors, though in but 11 was it the only cause known. It is probable that its presence in the forefathers, by producing debility of the offspring and a liability to degeneration of all sorts, may predispose to the development of Friedreich's ataxia.

4. *Syphilis* is said to have been present in the grandfather of Vincenzo Luongo (91), and some of Freyer's patients had exhibited an eruption which was possibly syphilitic. Except in these instances there was no evidence of a deterioration of the nervous system through inherited syphilis.

5. *Consanguinity* of the parents (grandparents in Mastin's cases) is reported as existing in but 7 cases in 4 families, viz., those of Seeligmüller, Erlenmeyer, Mastin, and Mendel. In the last 3 it would appear to have been the principal predisposing influence, but in the first family there also existed a very neurotic history.

6. We read of no *other possible ancestral causes*, except that the mother of Freyer's cases is said to have been feeble, and that some of the uncles and aunts of Musso's patients suffered from general debility and other signs of poor constitution.

As regards *conditions discovered in the other children* of the same family which rendered probable the existence of a common inherited taint or tendency to degenerative processes, we find that in 20 families of brothers and sisters there are said to have been 31 individuals presenting

the symptoms of Friedreich's ataxia, but who did not come under professional observation; this does not include the relations of the cases reported by Fellows, where the number is not stated precisely. Other neuroses, including exceedingly nervous temperament, are reported present to a greater or less degree in 14 families —32 cases. In 13 families—27 cases—there existed other suspicious conditions in the brothers and sisters indicating an inherited feebleness of constitution. Thus in 5 families (13–15, 19, 56–58, 96–97, 132–133) there had been numerous early deaths, and in Musso's 2 families 7 stillbirths were observed. In 2 of Ormerod's families (69–75) one or more children had feeble reflexes, and in Freyer's there had possibly been syphilis in several children beside the patients themselves.

The brother of Smith's oldest case (100) lacked all moral sense, and the younger brother of Botkin's patient is described as having moral insanity. The sister of 2 of Seguin's cases (96, 97) died of phthisis. In Palma's report a curious occurrence is described. The phthisical mother suckled but 2 of her children, of whom one was the patient, Giuseppi; the other being a sister who died of phthisis. The others were nursed by another woman and remained healthy, and Palma believes that the milk from the phthisical mother was a factor in the development of the ataxic disease.

It must be noted in this connection that there are certain cases where no trace of any inherited or of inheritable taint whatever has been discovered, or at least reported either in the ancestors or other descendants. An inspection of the table will show this to be true in 11 instances (24, 44, 55, 76, 99, 107, 109, 116, 117, 122, 140), though the patient of Erlicki and Rybalkin was

a foundling, and nothing was known of her relatives; while the family history of McAlister's case is not published.

As regards heredity, then, statistics show that the existence of ataxia or of some other nervous disorder in the ancestors exerts a strongly predisposing influence on the development of Friedreich's ataxia in the descendants; that intemperance has a much less powerful and even questionable effect, and that the agency of other conditions is insignificant, except as they debilitate the parents' constitution.

Age.—The influence of age in determining the onset of Friedreich's ataxia has been variously estimated. Friedreich made the claim, based upon his own cases, that the disease developed at about the time of puberty; but this is clearly too narrow a limit. Numerous instances have been reported in which it appeared much earlier than this, and a few are recorded in which it was not detected until after the age of 20. Looking through the table it will be seen that the first symptoms were observed as follows:

In 15 cases	by	2	years of age.

and, including these,

In 39 cases	before	6	" "

Further,

In 45 cases	at from	6 to 10	"	"
" 20 "	"	11 " 15	"	"
" 18 "	"	16 " 20	"	"
" 5 "	"	20 " 25	"	"

The age of 14 of the remaining 16 cases is not accurately enough stated to allow of placing it in any of the periods given above; but in all it was less than 16 years, and in all but 2 (4, 112) less than 12 years, while in

4 (76, 81, 82, 95) it was probably less than 5 years. The 2 remaining cases are those of Seeligmüller (23) and Smith (100). In the former, difficulty in walking was not observed by the patient until after the age of 27, though it is uncertain just when ataxia actually developed; and in the latter no symptoms were perceived until the age of 66. (See remarks on cases in Table I.) The statistics show, then, that in *over one-half* the recorded cases the first symptoms were perceived before the age of 11 years, and that in only a small number did they develop after 16.

Sex.—The statements as to the sex chiefly affected vary somewhat, depending simply on the number of cases of the disease which the various tabulators had collected. Of the 143 cases reported here 86 were males (60.14 per cent.), and 57 females (39.86 per cent.)

Acute Diseases.—It is a most interesting fact that the occurrence of certain acute, and usually infectious, diseases has sometimes precipitated the appearance of the ataxia. Most probably the necessary conditions for its development were already present and were only incited to activity. This precipitation is described in 20 instances as follows: Typhoid fever (16, 52); pertussis (47); variola (64); meningitis (56); acute spinal affection of a rather uncertain nature (116); periostitis (119); morbilli (142); scarlatina (49, 90, 105, 143); scarlatina and morbilli (114); rheumatism (100, 132); probably diphtheria (69, 70, 71); diseases not clearly defined (117, 137). As a rule, the febrile disease precedes the development of the ataxic symptoms either immediately or with only a short interval. In 3 of Musso's cases, however (64 and 2 in Table II. A.), 2 years had elapsed since the patients had suffered from variola, which the

author nevertheless considers the exciting cause; while in Erlenmeyer's, 1 of Dreschfeld's (16), and 1 of Rütimeyer's (47) cases the acute disease had occurred respectively 5 months, 2 years, and 1 year previously. A degree of doubt cannot but attach to the existence of any causal relation in some of these cases. Bury believes that chorea may precipitate Friedreich's ataxia, but it seems more probable that the choreiform movements witnessed in one of Rütimeyer's cases (in Table II. A.) and in certain other instances were but anomalous early symptoms of the ataxic disease.

Clinical History.

The disease usually begins early in life, and nearly always attacks the lower extremities first; the initial symptoms being unsteadiness and weakness, with an oscillating, staggering gait accompanied by frequent falls. Exceptionally other symptoms, perhaps accidental, appear before the affection of the legs. *Eclampsia* occurred repeatedly in a patient of Vizioli's (91); and in one of Rütimeyer's (53) it was seen at 6 weeks of age and left the patient feeble, so that he never learned to walk as well as the other children. Friedreich describes the early occurrence of *hysterical attacks* in one case, but considers them independent of the ataxia. In Botkin's case the symptoms were ushered in by a fit of uncontrollable laughing coming on in church,—possibly of an hysterical nature. *Pain* in the head or other parts has been noted in a few cases before, or with the earliest ataxic symptoms, as have been *vomiting*, *vertigo*, *curvature of the spine*, *dorsal flexion of the toes*, *palpitation of the heart*,

choreiform movements, etc. They will be discussed in the proper place.

All these early symptoms, however, are of very unusual occurrence, if indeed they are other than purely accidental; and disregarding them, it appears that the lower extremities were first attacked in 114 of the 143 cases. In 10 instances the involvement of the legs and arms was noted almost simultaneously, though in one of these (99), Sinkler's, the mother seemed to think that the awkwardness was first in the arms. In 8 instances the speech and the four extremities were affected together; in Descroizilles' case, and very probably in one of Vizioli's (91) also, the legs and the speech were simultaneously involved, no reference being made to the time when the arms became ataxic; and finally in 2 instances (106, 134) the upper extremities were first diseased. The part first attacked in the remaining 8 cases is not definitely stated.

The speed with which the disease spreads varies very greatly. The average lapse of time in 35 cases between the first affection of the upper and lower extremities, where the date was accurately enough stated for calculation, and not including the cases of simultaneous involvement, was about 6 years; but the variation is so great that this average is of little value, and a better conception can be obtained by consulting the table itself.

In some of the patients the disease had not reached the upper extremities when reported, and in others it is not clearly stated whether or not they were affected. The longest interval mentioned, before the involvement of the arms was noticed, equals 20 years, and occurred in one of Dreschfeld's cases (16). Next in order comes one of my own (143) with an interval of 17 years.

These are, however, unusual, and the ataxia perhaps most frequently reaches the arms after the lapse of 1 to 3-5 years.

In Case 6 one leg was first attacked and then the arm of the same side, next the remaining leg and finally the other arm; or one leg may be involved and then that of the opposite side, as in Cases 2, 3, 35, 126. In certain instances one side of the body always remained more diseased than the other; as in 1, 6, 107, 122, and in Teissier's case (59) the upper limb was more incoordinate than the lower.

Ataxic movements may develop even in the head and trunk; either with those in the upper extremities or later. Bulbar symptoms, usually represented by nystagmus and affection of speech, are very constantly present. It is generally stated that they appear late in the disease, coming considerably after the affection of the arms; yet in 31 cases in which the date of the development of both classes is definitely given, the appearance of the bulbar symptoms (usually the affection of speech) averaged only about $1\frac{1}{2}$ years later than that of the incoördination of the arms; and the range of variation was not at all great. In 18 of these cases both developed at the same time, and in 6 the interval was but 1 year or less, while the longest intermission was but 9 years, viz., in one of Warren's cases (39). Yet these statements do not strictly express the truth; for doubtless bulbar symptoms would have developed later in many cases in which none were reported, and the average lapse of time would probably be increased.

As the disease advances, more or less paralysis with some muscular atrophy often makes its appearance, contractures of the muscles may develop, and talipes and

curvature of the spine commonly occur. Pain sometimes is present and exceptionally is severe. The patient becomes unable to walk, and loses more and more control over the bodily movements, until he is rendered almost completely helpless, while speech may be nearly or quite unintelligible. Finally death ensues from progressing asthenia; or oftener from some intercurrent disease.

Infectious or other febrile diseases have power to accelerate as well as to precipitate the ataxic disease. This aggravation has been either general, or limited to certain regions of the body, and is reported 14 times in 13 patients; one of Sinkler's cases (98) having once been made worse by scarlatina, and again by malaria. The acute diseases which have accelerated the progress of the nervous disorder are: rheumatism (13, 48); scarlatina (69, 89, 98, 133); malaria (98); typhoid fever (76, 83, 85); typhoid fever followed by measles (141); probably diphtheria (74); bilious fever (40); a tetanoid attack (128); some affection not clearly defined (102). The increase of the ataxia after recovery from the acute disease was so great in 5 cases (76, 83, 85, 98, 141) that the patients were found to have lost the power of walking entirely or except when assisted. Not included in the 13 cases is the second patient of Friedreich, in whom parturition at the age of 23 so augmented the severity of the symptoms that she was never again able to walk without assistance or unless holding to objects. A patient of Musso's (61) is also to be mentioned, in whom epileptiform seizures appeared to precipitate the involvement of speech.

Symptomatology.

Motor Symptoms.

Motor Ataxia.—*Motor ataxia of the lower extremities*, shown either in the gait or in intended movements, or in both, is reported present, or as having been present before loss of power supervened, in 128 cases. In the remaining 15 ataxia of the legs is not directly mentioned, though it is certainly implied in some of them. Freyer distinctly states that the gait was good in one of his cases (121), but the disease was only beginning. Hammond's effort in his article was to prove that the cases reported by Friedreich were not at all like locomotor ataxia. While, therefore, he will not attribute the motor affection in his own 6 patients to ataxia, he nevertheless admits that the feet "were moved exactly like those of a drunken man when he attempts to walk;" and in one case (36) distinctly speaks of lack of coördination, while in another (35) he implies that closing the eyes made an ataxia of station worse.

34 of the 128 cases exhibited increase of incoördination on closing the eyes, or in some instances had done this before the power of motion in the legs was lost; in 19 instances there was no such increase; in 1 (6) closure of the eyes had at one time produced it, but later did not, though the legs could still be moved. In the remaining cases no note is to be found in the original report.

The *gait* may be that characteristic of tabes dorsalis—*i. e.*, with the extreme anterior propulsion and elevation of the foot, and heavy fall of the heel; but I have found this stated in very few cases, as in 18, 25, 60, 80. Certain others—*e. g.*, 17, 66, 98—are described as of

"typically ataxic" gait; which may very probably indicate a gait like that seen in tabes. On the other hand, in over 45 instances I have noted it designated as "like that of a drunken man," or "oscillating," or as "not typically ataxic," etc. Musso described it as exhibiting a weakness, tremor, and a tendency to a *lateral projection of the feet;* and even as early as 1871 Bradbury said his case was not like tabes on account of the way in which the legs were thrown out at random. One of Musso's patients (61) said of herself that when walking she "occupied the whole road." In many other cases I have made no exact note of the character of the gait, or it is not mentioned by the authors; but there would seem to be no question that the oscillating, drunken, cerebellar gait is by far more characteristic of Friedreich's ataxia than is that usually seen in tabes.

The eyes are sometimes kept fixed on the floor while walking, as in both patients of Massalongo's, and in that of Carre's; sometimes the gaze is directed straight outward, as in Mendel's and some of Vizioli's cases.

Ataxic station is expressly mentioned or implied in 73 cases, and undoubtedly existed in many more. In 7 of the 73 it was certainly or probably absent when the eyes were open, but developed when they were closed. Of the 66 remaining it was increased by closing the eyes in 42 instances—*i. e.*, Romberg's symptom existed—and in 10 there was no such increase. In 13 it is not distinctly stated whether Romberg's symptom existed or not, and in 1 (6) it had been witnessed earlier in the case but afterward disappeared.

Ataxia on motion of the upper extremities is usually present and well marked. The movements are irregular and often jerky. Buttoning the clothes or threading a

needle becomes difficult or impossible; and even less delicate actions, such as touching the tip of the nose with the finger or carrying food to the mouth, are equally badly performed. In the attempt to make any voluntary motion the action is often overdone; thus in trying to grasp an object the hand may be advanced past it, as in 97. Prehension is often very peculiar, the fingers being spread over an object like a claw; as was well illustrated by one of my own cases (141). Bury also speaks of the claw-shaped grasp in Case 115, and Seguin describes the over-extension and spread of the fingers before grasping in 93 and 95. I have already referred to the peculiar infantile grasp in 2 of my own cases (141, 143). I find incoördinate movements of the hands or arms reported in 111 cases; increased by closing the eyes in 21 of these; not increased in 26; while in the remaining 64 the question of increase is not referred to by the authors. Many of the 32 cases in which ataxia of the upper extremities is not mentioned in the table undoubtedly possessed it, but the reporter has failed to state the fact clearly. In only 11 instances (17, 18, 23, 24, 28, 43, 58, 63, 75, 100, 108) is it distinctly said that there was none. Irregularities in distribution are sometimes witnessed; thus one of Ormerod's cases (71) exhibited ataxic movements in only one of the hands, viz., the left.

Muscle-sense.—Though coming somewhat out of its natural order, muscle-sense can best be considered here. Whether Romberg's symptom is due to a disturbance of muscle-sense, or to some entirely different cause, forms a most interesting question, but one too extended to be fully discussed in this paper. Friedreich claimed that his cases proved both locomotor and static ataxia

to be independent of any disturbance of sensibility. The case of Galassi's rendered that writer sceptical as to any relation between Romberg's phenomenon and muscle-sense. Musso, too, found Romberg's symptom in 4 of his cases, while in none of them was the muscle-sense otherwise affected, though carefully tested in various ways.

The muscle-sense is described in the table as normal in 32 instances. In some of these the authors merely state that it was unaffected and probably include the absence of Romberg's symptom, while in others the manner in which it was tested is detailed. It happens, now, that 15 of these 32 cases exhibited increased incoördination of the motion of the legs or of station on closing the eyes, yet the muscle-sense, strictly named, was undisturbed, as shown by the testing with weights, grasping with eyes closed after an object whose position was known, and in the knowledge of the position of the members in space. This would seem to confirm the view that Romberg's phenomenon depends on something more or other than the loss of this sense. An additional proof is found in the fact that in 11 cases the muscle-sense was more or less diminished, in 4 of which there was no Romberg's symptom, and in 3 others no mention is made of it, if it existed.

Static Ataxia.—By this title Friedreich designates the *ataxia of quiet action—i. e.*, of the muscular force required to keep any part of the body still while unsupported, as when holding the arm extended. In contradistinction to this, the term "locomotor ataxia," or, better, "motor ataxia," would indicate the incoördination which appears only when a voluntary movement is attempted. The ataxia of station is, of course, a variety

of static ataxia, and has already been discussed, but nothing has yet been said of its other forms. Friedreich states that static ataxia is almost the last to appear, and Charcot and Ormerod express the same opinion, while the former also claims that it is characteristic of the disease and does not appear in tabes. Though Pitt says that the history of the reported cases indicates that it is an earlier symptom than the locomotor ataxia, my own search through the literature would confirm quite decidedly the views of the writers first mentioned. I find it described in the extremities in 2, 6, 13, 15, 22, 46, 49, 68, 113, 114, 115, 117, 124, 127, 137, 138, 139, 141, and many others, usually of the severe forms. The exact number I have failed to record, though it is, I think, oftener absent or not described than present.

In the hands while lying passive in the lap, it may be seen as peculiar slow movements of the fingers, which sometimes resemble athetosis, as in Charcot's second case (127), one of Sinkler's (139), and one of my own patients (141). In the arms it appears as slow wavy oscillations when the member is held outstretched, or even as marked choreiform movements, as Erlenmeyer describes in his patient, which he, however, classifies as evidences of static ataxia, as does Charcot the constant non-rhythmic oscillations of the legs, seen in his first case (67). Botkin speaks of a similar condition in his own patient, and in one of Seeligmüller's cases also (22) there were observed the same constant trembling movements when the legs were in certain positions. Numerous other instances of static ataxia of the limbs are reported, but it is seen to best advantage in the oscillating movements of the head, which are described in 51 instances; and undoubtedly most of the cases exhibiting "tremor"

or "choreiform movements" of the head should be added to these. The oscillations may be slight or extensive, constant or seen only under excitement. Friedreich described in Case 6 an irregular nodding motion of the head, "like one going to sleep," and this has since been often witnessed, as in Cases 45, 127, and others.

Ataxia of the trunk is reported in 22 instances. In others its occurrence is implied, though with but one exception no reference is made to it.

Tremor.—Tremor and choreic movements may naturally be next described, since they are so closely allied to static ataxia. Tremor of some part of the body is referred to in 8 cases. In most of these it should probably be attributed to static ataxia—*e. g.*, 2 of Smith's cases (102, 103) had tremor of the head on voluntary motion, and one of Teissier's (59) exhibited little oscillations of the whole body when at rest. There is nothing found which at all recalls the intention-tremor of multiple sclerosis, except in Glynn's case, where there existed oscillations of the head and trunk, a forward and backward oscillation of the tongue, with a shaking of the arms which became violent when reaching for a cup. In Cases 22 and 133 the muscles of the face exhibited slight tremor.

Choreiform Movements.—Choreiform movements are referred to in 17 instances, and are, like tremor, probably in most cases evidences of static ataxia; being, in fact, recognized as such by some of the authors reporting them. They are usually seen in the extremities, but in 6 cases grimaces and twitchings of the face are alluded to (23, 56, 69, 71, 97, 127). Chorea has appeared as one of the earliest or even the initial symptom in certain cases, as, for example, in 2 cases of

Ormerod (69, 71) and in that of Gower's and Pitt's (27). Pitt states that 3 other cases in the family began with choreiform movements, which were, however, not referred to when Gowers reported them; and I do not think that statistics corroborate Pitt's view "that the first symptoms noticed are disorderly choreiform movements." Erlenmeyer's case is especially interesting in this connection, since Erb pronounced it to be an instance of chorea, while Friedreich deemed it some spinal affection, though not ready to admit it into the same class with his own cases. Erlenmeyer, however, insisted that it was an example of Friedreich's ataxia, and it has since been unquestionably accepted by Rutimeyer. There seems no reason to consider it other than a genuine case.

Spasm.—Involuntary spasmodic contraction of the muscles has been reported in 21 instances. These are sometimes painful, perhaps oftener not, and occur chiefly in the lower limbs when the patient is lying in bed or sitting. 4 of Friedreich's cases exhibited this symptom, apparently with cramp-like pains. It was seen also in a case each of Hammond's (33), Rütimeyer's (47), and Smith's (102); the legs of the last patient being at times drawn up to such an extent that she begged to have weights put on them to pull them down. In 2 of my own cases (142, 143) these spasms occurred at night, and the patients were unable unassisted to straighten the limbs immediately.

Fagge's patient suffered from a spasmodic action of the muscles of the face when an effort was made to talk, drawing the mouth into a meaningless smile; and in Botkin's patient there occurred spasm of the muscles

of the neck, hands, and feet, with constant grinding of the teeth, the case being unique in this last particular.

PARALYSIS.—More or less paralysis is a very common feature in advanced cases, and it may, indeed, appear early in the disease; but as Ormerod justly remarks, the initial weakness in the legs, and even the loss of the power of walking called by the friends "paralysis" are probably due simply to the incoördination in most instances. Many of the cases which have been subjected to careful medical examination in the early stages support this view. (See "Inability to Walk.") Muscular paralysis is reported present in 56 cases, absent in 53, and is not directly mentioned in 34, though in a number of these it almost certainly existed. Many of the cases in which paralysis is reported absent were not far advanced in the disease, and the percentage of cases affected would certainly be increased could the clinical histories be followed further. It may become extreme in advanced cases, as in one of Vizioli's (87), who had been affected in early infancy and who died at the age of 46, having reached a state of complete immobility apparently of all the muscles, excepting those of mastication and respiration. In Therese R. (123), diseased 28 years, the legs were totally paralyzed, and the arms and trunk largely involved; and Emma W., one of Smith's cases, was in a similarly helpless condition. The rapidity of the development of paralysis does not, however, always depend on the duration of the disease; since in Glynn's case, for example, which had lasted but 4 years, the muscular power of the limbs was decidedly diminished, and in Kahler's and Pick's patient, diseased 8 years, it was nearly gone; while in one of Freidreich's cases (6), on the other hand,

the patient died of typhoid fever with normal muscular power after suffering from ataxia for 24 years, and in one of Smith's (103) there was no paralysis after 18 years of the disease.

Inability to Walk.—In a number of cases standing or walking had become impossible as the disease advanced. This was due in some of them to the paralysis, but in others it clearly depended on the existence of excessive incoördination, since the actual strength did not seem to be at all diminished. Friedreich calls especial attention to this condition in Case 6. A review of the table shows that in 54 cases the patients were no longer able to walk, except with the aid of crutches or when assisted by some person. In 4 instances the authors do not make any statement concerning it, and in 86 the power of walking was still preserved, though often only when the patient steadied himself by the furniture or walls. The relation between the inability to walk and the paralysis may be seen by comparing these two columns in the table. In 10 of the 54 cases paralysis is stated to be absent; in 9 it is not mentioned, and in the remaining 35 there was more or less of it, though it is very certain that in many of them the term was wrongly applied, especially where the table shows that no atrophy of the muscles was to be found. In some of them paralysis is expressly stated to be very slight or even questionable, and was clearly not sufficient to account for the loss of the power of locomotion. The *age* at which this loss occurred is noted in the table whenever given in the original article, but the lapse of time from the onset of the disease to this event is so variable that to average it would be useless. In Cases 37, 38, 39, 87, and 88, the patients never walked; while

in 1, 32, 34, 44, 55, 139, and 141, walking unassisted was impossible within a year after the disease began, and in the last case within a month after the first onset. In Case 5 the patient was able to walk through 27 years of the ataxia, up to the time of death from an intercurrent disease, and the table shows other cases in which the ability persisted for years.

CONTRACTURES.—Contractures of various parts are referred to in a number of instances, and are usually among the later symptoms; and may be divided into Talipes, Curvature of the spine, and Other contractures.

Talipes is reported in 27 cases, in 14 of which it was of the variety equino-varus. The remaining 13 are named as follows: equinus (40, 41, 42, 58, 114, 115, 122); equino-valgus (141, 143); valgus (112); varus (134); cavus (126, 136). The last case, though not named directly "cavus" by the author, is best summed up by this word. Talipes is a late symptom, and, indeed, has only been seen in 7 cases which still preserved the power of walking. It is associated often (12 cases), though not always (9 cases), with some degree of muscular atrophy. In 2 of Smith's patients (101 and 102) the talipes was immovable; in one of Bury's (114) there was very little motion at the ankle-joint, and in one of Sinkler's (139) the tendo Achillis was very tense.

Curvature of the spine, considered by Rütimeyer a form of contracture, appears to be largely independent of the degree of paralysis. It is usually one of the later symptoms, though in Cases 4 and 10 there was curvature of the spine—perhaps accidental—2 years before other symptoms appeared, and in Cases 9, 71, and perhaps others it was among the early symptoms. It is reported present in 57 cases; being sometimes slight,

sometimes very marked; and is described in 28 of these as scoliosis, in 20 as cypho-scoliosis, in 8 as cyphosis; while in 1 the variety is not designated.

Contractures of other parts of the body are not infrequent as late symptoms, though in one of Bury's cases (113) they were present from the first. They are mentioned in 24 cases; all except 100, 101, 102, and 115 exhibiting dorsal flexion of the toes. There were also contractures of some of the fingers or of the hands in Cases 49, 50, 51, 101, 113, 115. In one of Smith's cases (101) the elbows were flexed; in another (102) the muscles of the thighs and calves were much contracted; in another (100) the calf-muscles were tense, and in one of Sinkler's (98) the plantar fascia was contracted.

Electrical Contractility.—The electrical contractility has been tested in only a few instances, and appears to reveal nothing characteristic. In 31 cases it is reported normal, sometimes the faradic current being specified, often the nature of the current not being named. In 2 instances (66 and 100) it was normal or increased. In 9 cases (2, 17, 19, 81, 89, 91, 103, 124, 136) it was slightly diminished; and in 2 (59, 60) the faradic contractility was increased. In 3 instances (113, 114, 115) the reaction of degeneration was detected; the faradic contractility being diminished in the first and normal in the second. One of Smith's cases (101) exhibited decreased faradic contractility but increased response to the galvanic current; while in Descroizilles' patient the faradic reactions were normal and the galvanic possibly diminished.

Examination of the electrical sensibility has been re-

ported in a few instances, but has taught nothing of importance.

Reflexes.—One of the most important studies connected with Friedreich's ataxia is that of the *patellar reflex*. In the 143 cases reported the knee-jerk was abolished in 91, while in 30 the condition is not stated. The absence would seem, then, to be a very constant symptom, as it is a very early one. In 2 of Ormerod's cases (72, 73), for example, it was observed before the diagnosis could be made. In Leubuscher's case the reflex was lost during the first half year; in Jakubowitsch's, which had only been diseased a month or so, it was very greatly diminished; and in 15, 21, 28, 56, 74, and others it disappeared within 1-3 years after the first appearance of the symptoms. The patellar reflex is nevertheless not always absent, though this claim has frequently been made. It is reported diminished in Fellows' patient and one of Warren's (43), and much diminished in 7 instances. But in 6 cases (63, 65, 85, 100, 137, 139) it is said to be normal; in Descroizilles' patient, normal or exaggerated; and in 6 cases (22, 23, 66, 68, 107, 138) exaggerated. Though all of these have a fair claim to be considered instances of Friedreich's ataxia, objection might be raised to some of them on the ground that in still other respects they were anomalous. (See remarks on Table I.) The patient of Prince's, however, though having exaggerated reflexes, appears to be an unquestionable instance of it, and Cases 63 and 85, with normal reflexes, are typical in other respects and belong respectively to the families reported by Musso and Vizioli, which contain some of the most striking cases known. Massalongo's 2 patients are beautiful examples of the disease; yet in one the knee-

jerk was normal, and in the other exaggerated; and I have personally examined the later patients of Sinkler—the MacDonald children—and cannot but agree with others who have seen them, that they are undoubted, well-advanced cases of Friedreich's ataxia, yet without the absence of knee-jerk.

As Westphal states, the knee-jerk will not be abolished unless the lumbar enlargement be involved; and it is easily conceivable that this involvement might fail to occur in undoubted cases of Friedreich's ataxia.

We cannot, therefore, but conclude that though abolition of the patellar reflex is a very important diagnostic sign of the disease, yet genuine cases may occur in which the reflex is slight, normal, or even exaggerated.

Very exceptionally *ankle clonus* has been observed. I do not recollect reading of it in any cases but those of Descroizilles' and Fellows'.

As regards the *cutaneous reflexes* the plantar reflex was normal in 40 instances, absent in 11, diminished in 4, and increased in 7. The other cutaneous reflexes were normal in 26 cases in which they were tested to some extent, diminished, at least in part, in 7, absent in 1, and increased in 1.

Trophic and Vaso-motor Symptoms.

These two sets of disturbances are so nearly allied that I have classified them together.

Atrophy of the Muscles is comparatively unusual even where paralysis is well marked. In 60 cases there was no muscular atrophy, and undoubtedly it was absent in many, if not most, of the instances in which no reference is made to it. The lower extremities are the parts usually attacked, though the arms are sometimes in-

volved. In 11 cases atrophy is said to be slight, and in 24 marked. This does not include my own case (142), in which the great atrophy of the left leg and thigh was evidently independent of the ataxic disease. Some of the patients exhibited extreme atrophy; thus Case 50 had both legs and arms much wasted, as had Cases 19, 40, and 64.

Other Trophic Changes—which are tabulated in the same column with vaso-motor affections—are very unusual. Bedsores are said never to develop in Friedreich's ataxia. One, however, was observed in Case 2, but was superficial and soon healed. The skin of the legs was in parts firmer, thickened, and adherent to the subjacent tissues in one of Sinkler's earlier cases (99); Vizioli reports an extreme development of adipose in the atrophied legs of his patient Vincenzo (81), and Smith reports enlargement of the feet of one of his cases (101), while in a patient of my own (143) they seemed smaller than normal. Two other patients, of Smith's and Vizioli's, respectively (102 and 85), and one of Seguin's (93), suffered from chilblains, which easily suppurated in the last case. These are so equally a vaso-motor affection that other disorders of this class may be expected to occur.

Vaso-motor Affections are represented in 19 cases by coldness of the surface of the body or especially of the feet, with more or less blueness and sometimes œdema (19, 40, 41, 42, 46, 47, 48, 51, 54, 57, 69, 74, 75, 93, 95, 101, 102, 142, 143). In 2 instances flushings are reported; of the head and face (63), and flashes of heat (2). [When both vaso-motor and trophic affections, not including muscular atrophy, are present, the sign in the table is +.]

Sensory Symptoms.

Pain.—The absence of the severe initial lancinating pain of tabes is one of the most characteristic symptoms of Friedreich's ataxia; and their occurrence in Dreschfeld's and a few other cases contributed to throw doubt upon the diagnosis. Pain of some sort, before the other symptoms appeared, or early in the course of the disease, was present to some degree in only 22 cases, absent in 79, and probably wanting in most of the remaining. Botkin's and one of Musso's cases (61), as well as 2 of Friedreich's (13, 14), suffered from headache before other symptoms appeared, and Bradbury's case began with pain and weakness in the back. The patient of Carre's suffered from severe pain in the legs and feet; and that of Jakubowitsch's from pain in the knees, shoulders, and head at the very beginning of the ataxic affection, while Friedreich's Cases 3, 4, and 5 complained of considerable early pain of the lower extremities. With these exceptions pain at the beginning of the disease has been insignificant, and in many cases was probably accidental. Pain after the disease has become well established is comparatively more common. I find it recorded in 47 cases, in many of which it was certainly unconnected with the disease itself. In about half of this number it was well marked, and in the others slight; while in 63 cases it is stated to be absent and in the balance was presumably so. Among the cases in which it was severe may be noted 2 patients of Musso's (61 and 62), who suffered from intense headache at certain periods, accompanied or followed by a temporary increase of the ataxic symptoms. Severe lightning pains are rare, and are perhaps best illustrated by one of Fowler's patients (77).

Lissette Süss (5) suffered from gnawing and neuralgic pains and painful spasms in the limbs; and several other of Friedreich's cases exhibited similar sensory disturbance. Some of Seguin's (96, 97) and of Smith's (101, 102, 103) patients had marked pain in the lower extremities, though in 102 these seemed rather to be due to the intercurrent and fatal acute myelitis. Maria Vitielli (85) suffered from headache and pain in the articulations. Tenderness on pressure over the spine has been reported in Cases 63, 64, 85, and a few others.

Cutaneous Sensibility.—The cutaneous sensibility is generally not much involved. In 74 instances it was normal, in 16 no reference is made to the subject, and in 47 there was more or less diminution of tactile sensibility. In 2 cases (7 and 25) it was normal or increased, and in 3 cases (40, 60, 136) increased. In Descroizilles' patient it was at one time slightly diminished, but later normal.

The diminution of sensibility—usually tactile—has generally been slight and often questionable. Sometimes it could be detected by the æsthesiometer; sometimes the touch of the finger could not well be felt. Often the sensibility to pain was blunted also, and in certain cases the conduction of sensation was retarded. Among the most marked instances of anæsthesia may be noted the second case of Friedreich's, the first of Musso's, 1 of Dreschfeld's (16), and 2 of Smith's (102, (103); the last 2 patients being scarcely able to distinguish pinching and pricking of the skin from simple touching. In one of Freyer's cases (119) there was total anæsthesia in spots; but the most striking example is Therese R. (123), in whom the lower limbs had become totally anæsthetic after 7 years' illness from Friedreich's

ataxia. Evidences of a degree of anæsthesia are further seen in Cases 55, 103, and 100, in which there was respectively a sensation of cushions, of velvet, and of a sponge under the feet.

Muscle-sense has been already discussed in connection with Romberg's symptom.

Paræsthesia.—Some form of paræsthesia, including girdle sensation, is reported in only 18 cases. In 43 instances (0 in table) there was no mention of any form of paræsthesia, and it is stated that either girdle sensation, or paræsthesia of other kinds, or both classes were absent. It is fair to presume that the majority of the remaining cases were free from any such affection. In 8 instances a girdle sensation is reported, namely, in 22, 103, 132, 141, 100, 102, 114, 119. In the first 4 it was very slight, but in the others well marked; Smith's patient (102) having it perhaps most strongly developed. Seeligmüller's second patient felt as though the clothes everywhere were too tight. Paræsthesias of other kinds, such as formication, tingling, numbness, etc., were observed in 14 instances (6, 7, 9, 17, 22, 45, 46, 54, 69, 100, 102, 107, 119, 135). In few were they more than very slight, and in none severe.

Bulbar and Cerebral Symptoms.

Affection of Speech.—Affection of speech is one of the most prominent of the bulbar symptoms, as it is one of the most frequent characteristics of the disease, and one which would probably develop in all cases not cut short by some intercurrent affection. It is generally a later appearance, occurring as a rule about the same time or somewhat before nystagmus. As already shown

under "Clinical History," it does not always develop so long after the affection of the arms as has often been supposed, and may be affected from the first. It was present in 107 cases, absent in 21, and not referred to in the remainder. Speech may be scarcely perceptibly involved, or so greatly so that it is almost or quite unintelligible, as in one of Warren's (40) and one of Smith's (101) cases. It may be drawling and slow, as in one of Bury's (115) and in Joffroy's patients, or jerking and interrupted, or confluent, as in Jakubowitsch's case, or typically scanning. In Rudolf Blattner (49) there were frequent changes of pitch; in Hollis's case, speech was low and indistinct. Glynn's patient slurred his syllables, pronouncing "actually" as though written "axially." In Power's case it was sometimes slow, sometimes rapid and slurring, etc. Friedreich spoke of "ataxia of speech;" and the term applies especially well to the rapid pronunciation of words and syllables followed by a pause, and this again by the same jerking articulation as I have described it in one of my own cases (141). He considers it due to an incoördination of the articulating movements of the tongue. The peculiar rushing, tumbling speech which Seeligmüller observed in one of his cases (23) induced him to characterize the trouble in that instance as an "ataxia of thought;" since the patient seemed to begin a new sentence before he had finished the old one.

I have attempted to express by signs in the table the degree of the disturbance of speech in the different cases, but the character of this disturbance is too varied to be well shown. The scanning articulation is quite common, though it is not, I think, mentioned in the majority

of cases. As instances of it may be noted Cases 26, 59, 60, 61, 62, 64, 102, 112, 114, 122, 127, 143.

Face, Mouth, and Throat.—The *tongue* is not infrequently affected; usually by a fibrillar tremor, sometimes by an irregular jerking or a to-and-fro movement. It is reported involved in 24 cases, and not affected in 30, including Case 2, where a previously existing tremor had disappeared. In Quincke's and Rütimeyer's first case (46) the tongue could not be held still in the mouth, but this very active movement was afterward substituted by a simple tremor. In Erlenmeyer's case it would not remain quiet; in one of Teissier's (59) it exhibited little oscillations, and in Glynn's these were larger, while the tongue was seen "curling and uncurling in a most curious way." In Ferrier's it was unsteady when projected; in the first of Friedreich's it trembled and twitched, and in that of Mendel moved backward and forward but was without fibrillar tremor. Nearly all the other cases exhibited fibrillar tremor only. At one time in Case 2 the tongue would become motionless for some moments and the patient unable to speak. There was also some paresis in Joffroy's patient.

Mastication and Deglutition are usually spared, but may become involved in advanced cases. Thus deglutition is described as almost impossible in 2 of Smith's cases (101, 103), and a similar difficulty was present to some degree in Cases 33, 45, 49, 50, 94, 143. Choking attacks of a peculiar nature seemingly not dependent on deglutition were observed in a case of Ormerod's (133).

There is sometimes *inability to retain the saliva* in the mouth; apparently distinct from or in addition to ptyalism. This was the case in one of Seeligmüller's

patients (22), one of Smith's (101), one of Sinkler's (139), and others. True salivation will be referred to later.

The *face* has often a very expressionless appearance; as, for example, in 11, 64, 65, and 136; and this condition, when combined with great difficulty in articulation, sometimes gives an erroneous impression of an affection of the intellect. Slight twitching or tremor occasionally is witnessed, as stated elsewhere. In one of Dreschfeld's cases (17) there is said to have been slight atrophy of some of the muscles, and in Joffroy's some paresis; while in Ferrier's the imperfect movement of the upper lip did not properly disclose the teeth.

Eye.—*Strabismus* is mentioned in a few cases—*e. g.*, in 8, 23, 56, 71, 80, 109, 115, 131; but it is uncertain in how many of these it was accidental. *Diplopia* is referred to in a few instances, as 7, 68, 136. *Blepharospasm* I remember to have seen described in but 3 cases, those of Botkin, Descroizilles, and Erlenmeyer, in the first 2 of which the spastic element elsewhere was very well marked. Some degree of *ptosis* was observed in Joffroy's patient and in one of Ormerod's (71).

But the most important feature connected with the organ of vision is *nystagmus*, which Friedreich regarded as a very characteristic symptom, though it is one of the last to appear. It was present in 56 cases, absent in 46, and not mentioned in the remainder, though it certainly would be found to have appeared in many of them could the subsequent histories of the cases be followed up. It is a much less common symptom than is affection of speech, as is exemplified by Friedreich's cases; the latter symptom being observed in all of them, and the former in but 5. It very frequently develops at

the same time with the affection of speech or a little afterward, but it may appear much later; not being detected in one of Friedreich's cases (2), for example, until 10 years, and in another (6) until 19 years after the disturbance of articulation was first noticed. So in one of Warren's patients (40), speech had been affected for 5 years and had become almost unintelligible, yet no nystagmus could be discovered. On the other hand, in Erlenmeyer's patient nystagmus appeared at the outset of the disease, lasted 3 weeks and then disappeared permanently. A survey of the table shows that there are but 4 cases (22, 48, 124, 125) stated to have had nystagmus without difficulty of speech, while in 2 others (92, 103) the latter is not mentioned. The form is nearly always what Friedreich called "ataxic nystagmus;" namely, a more or less extended, transverse, bilateral oscillation of the bulbs, appearing only when the eyes are fixed upon an object, especially if held at the side. The nearer the object is approached, the more marked does the symptom become, but when the eyes are at rest it disappears completely. It is of less rapid motion than the ordinary or static nystagmus, and, indeed, differs widely from it. In Leo von K. (22) it appeared to cease only when the eyes were directed at certain angles, which varied at different times. Botkin's case is said to have had involuntary turning of the eyeball upward, a motion which appears to be allied to nystagmus. "Static nystagmus" also—*i. e.*, that seen when the eyes were at rest—was observed in Cases 46, 51, 54. The *pupillary movements* are in some instances said to be sluggish, as 64, 69, 111, and others; or to be dilated, as in 45, 65, 66, or con-

tracted; but in no case were they found not to react to light and on accommodation.

Atrophy of the optic nerve, so common in tabes, occurs in Friedreich's ataxia with the greatest rarity, if at all. I have found ophthalmoscopic examinations recorded in 38 cases, and in none of them was there any change of importance noted except in Power's case, in which the disks were rather white; and in one of Seguin's (96), in which there was partial atrophy of both optic nerves. The condition of the *color fields* might prove of interest in showing the possible relation of the disease to locomotor ataxia. Very little has been done in this direction, though Oliver made a careful examination of one of Sinkler's cases (99) and found narrowed fields, leading him to believe that there existed ocular changes allied to those of tabes.

Vision is reported impaired in a number of instances in which no ophthalmoscopic examination had been made, as for example in 7, 11, 17, 35, 40, 51, 96, 97, 123. In Botkin's case there was total blindness of the left eye, but probably not dependent on the principal disease.

Hearing was deficient in a few cases, as in 50, 51, and 123, but this was probably purely accidental.

Intellect.—One of the features which distinguish Friedreich's ataxia so sharply from disseminated sclerosis is that it rarely has any effect on the mental power. In 79 instances the intellect is reported normal, while in 21 it was possibly more or less affected, though the study of these cases shows that the deterioration was generally only apparent or trifling. Thus it is stated that the intelligence was low, but not out of proportion to the social position (19); that the patient often forgot words (35); that the intellect seemed at first to be decidedly affected,

but was in reality very slightly, if at all so (40); that the patient said he thought slowly (98), etc. In only a few instances does the intellect seem to have been actually impaired. In one of Smith's cases (102), for example, the memory had become very deficient, and the simplest mental acts were the result of laborious effort; while a sister (101) would frequently scream for hours for no discoverable reason, and had also had epileptic seizures during fifteen years, though it is not certain whether they had any connection with the ataxic disorder. A case of Seguin's (94) became practically insane during the last two months of life; and Power's case had but weak intelligence, and often laughed spasmodically. In Brousse's case the intelligence was low, and one of Hammond's patients (33) appeared to have suffered an arrest of mental development to some extent. It seems open to question whether Friedreich's ataxia had any direct bearing upon the deficient cerebration of any of these cases; and even Seeligmüller's patients, sometimes excluded on the ground of cerebral disturbance, exhibited no greater affection of this nature than did their father, who was in other respects a healthy man.

Vertigo.—Vertigo is a not infrequent early or late symptom, being present in 29 cases and absent or not recorded in the remainder. 4 of Friedreich's cases had it to some degree, and the patient of Ferrier's was early so annoyed by it that he was unable to play with his companions, though the symptom later disappeared entirely. In Botkin's patient it preceded other symptoms by about two years, but had probably nothing to do with the ataxic disease; and in one of Friedreich's (3), one of Rütimeyer's (46), and one of Bury's (112) it was

among the early symptoms. Vertigo later in the disease was seen, for example, in Power's patient, who suffered from attacks of giddiness, with loss of consciousness and fainting; and in Catharine L. (105), where it was well marked, and brought on by reading or in other ways, as also in one of Smith's patients (100), where it was a constant symptom, greatly increased by standing. Other cases have experienced it even when in the recumbent position, as in Friedreich's second case, in which it was for a time the chief complaint. In certain other instances it was severe, though it usually is a symptom of no great importance, and is often probably accidental.

Visceral and Secretory Symptoms.

These are usually slight and possibly accidental; are reported present in 42 cases in all, and are best considered in classes, as follows: [In the table marked + if more than one class is present; if only one, the sign is —.]

Affection of the Bladder is rarely met with, being referred to in 13 cases; in 8 of which (8, 23, 55, 59, 96, 111, 114, 133) it is described as incontinence which was slight or occasional, or as occurring when laughing (55), etc. In Power's case, and in one of Warren's (40), incontinence seems to have been more marked, though never excessive. Sinkler's first patient (98) had some difficulty at the beginning of urination; one of Musso's (61) was unable to urinate while lying in bed; and Friedreich's second patient could only pass water in drops, and after long straining.

Affection of the Rectum is very rare, excepting that several cases had troublesome constipation—cer-

tainly no unusual feature in many conditions. In one of Seguin's patients (97) this is said to have been extreme. In the first case of Seeligmüller (22), on the other hand, the feces were sometimes expelled before the clothes could be removed; and the brother (23) was obliged to hasten as soon as the desire to defecate or urinate was felt. Descroizilles' patient suffered from constipation alternating with involuntary passages of urine and feces.

Disorders of the Sexual Apparatus have been claimed by some writers to be quite common, being represented in the males by impotence and in the females by affections of menstruation. This claim was probably based on the fact that 2 of Friedreich's cases were impotent, while some of the women had disordered menstrual functions. Later experience shows that *impotence* has only been reported in 3 cases, all told (1, 6, 17), though the perverted sexual feelings of Seeligmüller's patient (22) rendered him virtually impotent, and he might be properly classified with the others. On the other hand, the males of Vizioli's first family, though severe cases of Friedreich's ataxia, exhibited normal or unusually great sexual power. *Disturbances of menstruation* were considered by Friedreich to be a complication rather than a result of the spinal affection. They are reported in 10 instances (2, 4, 19, 30, 54, 61, 62, 69, 116, 117), consisting of such disorders as "scanty menstruation, beginning in the sixteenth year" (19); "menstruation at twenty, regular but scanty" (62); "has not menstruated at nineteen" (69), etc. One of Friedreich's cases (2), who had at times decided menstrual irregularity, conceived and bore a child while suffering from ataxia. Probably the most serious disturbance reported is that of Salome Süss (4), who did not menstruate until the age of twenty-

two, and then very irregularly and with intervals of several years. Among any 57 females suffering from any chronic debilitating disease, it is probable that 10 instances of menstrual disorders would be found equally severe with those reported here.

Other Visceral and Secretory Affections, some of which are allied to vaso-motor disturbances, are recorded as follows: Salivation in 5 cases (2, 50, 56, 59, 68); palpitation of the heart in 13 cases (2, 61, 62, 63, 5, 4, 19, 22, 23, 101, 102, 103, 104), in the last 8 of these being one of the earliest symptoms; persistent acceleration of the pulse in 8 cases (2, 19, 40, 59, 60, 119, 123, 124); profuse sweating in 3 cases (2, 50, 63); gastric disturbance in 9 cases (8, 57, 132, 133, 45, 101, 102, 103, 104), being one of the initial symptoms in the last 5; dyspnœa in 5 cases (2, 4, 5, 19, 102). Besides these there are mentioned polyuria (2), cough (4), intermittent albuminuria (13), nervous crises (61), and præcordial anxiety (62, 63).

Pathological Anatomy.

Among the 12 autopsies which have been made I have included that of Erlicki and Rybalkin, whose case was an excellent example of Friedreich's ataxia, except that nystagmus and the affection of speech had not yet developed. The authors admit that these symptoms would not appear until late, and make their case a text for the discussion of Friedreich's ataxia, yet hesitate to call it an example of it on account of the absence of these symptoms. Since the symptoms in other respects and the post-mortem lesions are those of the affection in question, there is every reason to include the case here.

The autopsies, arranged in the order in which they were reported, are as follows:

I. Andreas Lotsch (1); Friedreich; reported 1863. Died at 35 of typhoid fever. Ataxic 18 years.

II. Justinia Süss (3); Friedreich; reported 1863. Died at 31 of typhoid fever. Ataxic 16 years. Specimens re-examined 16 years later by Schultze.

III. Salome Süss (4); Friedreich; reported 1863. Died at 28 of typhoid fever. Ataxic 12–13 years.

IV. Friedreich Süss (6); Friedreich; reported 1877. Died at 38 of typhoid fever. Ataxic 23 years. Microscopical examination made by Schultze.

V. Josefa Strasik (19); Kahler and Pick; reported 1878. Died at 23 of phthisis. Ataxic 8 years.

VI. Charlotte Lotsch (2); Friedreich; reported 1880 by Schultze. Died at 51 of nephritis. Ataxic 34 years.

VII. Marie R. (30); Brousse; reported 1882. Died at 32 of cerebral hemorrhage. Ataxic 8 years.

VIII. Clara W. (102); Smith; reported 1885. Died at 29 of acute myelitis. Ataxic 19–20 years. Microscopical examination by Putnam.

IX. J. W. (117); Erlicki and Rybalkin; reported 1886. Died at 18 of phthisis and typhoid fever. Ataxic 2 years.

X. Robert Shaw (27); Gowers; reported 1886–7 by Pitt. Died at 28–29 of cardiac dilatation. Ataxic 9–10 years.

XI. Heinrich Kern (46); Quincke and Rütimeyer; reported 1887 by Rütimeyer. Died at 20 of fatty heart. Ataxic 13–15 years.

XII. Bertha Kern (48); Rütimeyer; reported 1887. Died at 16; cause of death not clear. Ataxic 9–10 years.

The following analysis will perhaps best indicate the lesions found:

Brain.—The brain (not including the medulla) was certainly examined in 10 cases and nothing of importance discovered in 9 of them (I., II., III., IV., V., IX., X., XI., XII.). An examination was probably made in VI., but it is not positively stated; in VII. there were the lesions of cerebral hemorrhage, and the pons was small; and in VIII. the skull was not opened.

Cord and Medulla.—As regards the microscopical appearance—*i. e.*, the size and shape of the cord and medulla—the latter is stated to have been very atrophic in IV.; and the cord was "small" in IV., V., VI., X., and XI.; while in 10 instances, viz., I., II., III., IV., VI., VIII., IX., XI., XII., the flatness of the posterior columns is particularly specified. In 11 instances, therefore, all told, the size of all or part of the spinal cord was below normal, no allusion being made to this point in VII. *Meningitis* was observed in 10 cases, viz., I., II., III., IV., V., VI., VIII., IX., XI., XII.; limited in 6 of them (I., II., III., IV., VIII., IX.) to the posterior portion of the cord. In XI. and XII. the pia was diffusely thickened in places; in V. and VI. the position of the inflammation is not clearly stated, and in the former could scarcely be called a meningitis; III. and IV. exhibited thickening of the ependyma of the fourth ventricle, while in VII. and X. there was no meningitis at all. Considerable fluid was found in the sac of the dura in a number of cases, and in Friedreich's first 3 autopsies the posterior fissure was obliterated.

Medulla.—The medulla has been examined microscopically in 8 instances; though whether lesions were found is not always clearly stated. In I., II., III., and

IV. there is said to have been slight extension of the posterior sclerosis to the medulla, with traces of change in the fourth ventricle. In IV. there was also sclerosis of the right anterior pyramidal tract extending a little above the decussation of the pyramids, and with slight increase of connecting tissue with numerous corpora amylacea in the restiform bodies. The funiculi graciles and funiculi cuneati are described as sclerosed in IX., X., and XII., but in the last up to the level of the upper decussation only, while in the first it is further stated that there was no change above the decussation. In IX. the funiculi rotundi were also involved to some extent. Case VII. exhibited a patch of sclerosis reaching to the level of the hypoglossal nucleus ; in VI. there was nothing found to note, and in V., VIII., and XI. the medulla was not examined.

Cord.—A microscopical examination has been made in all cases, though the improved means of investigation now at our command might show more extended changes in I. and III. than were reported.

The *Posterior Columns* were sclerosed from the lumbar to the cervical enlargement in all the cases, and even higher and into the medulla in those just described ; and the sectional area was usually sclerosed very nearly throughout. The postero-median columns were greatly degenerated in all the cases, but the postero-external columns less intensely and uniformly affected. In I., II., and III. the sectional area of degeneration was greatest in the lumbar region, though everywhere complete ; but in IV. the degeneration was most marked in the cervical and dorsal regions. The whole sectional area of V. was very uniformly sclerosed, except a healthy layer next to the gray matter. Case VI. is said to have been just like

IV. In VII. only the portion was affected adjacent to the central canal and to the cornua, and the sclerosis was most pronounced in, and reached the periphery only in the lumbar region, though almost doing so in the cervical cord. In VIII. the posterior columns were diseased nearly throughout, though more completely in the dorsal than in the lumbar region, and a narrow portion adjoining the posterior commissure was not involved. IX. exhibited a degeneration in section which was most intense above, but very general everywhere, except a small tip where the posterior commissure joined the posterior horns, and even this was diseased in the upper part of the cord. In X., also, the sclerosis was general, except a small portion contiguous to the neck of the horn in the lumbar and cervical regions. Finally, in XI. and XII. the degeneration of Burdach's columns increased somewhat in a downward direction as far as the lower dorsal region, below which it again diminished; in these cases, too, there remained a narrow strip of healthy tissue at the junction of the posterior horn with the posterior commissure, or along the posterior horn.

Gowers states that the cervical root zone never escapes in Friedreich's ataxia, as it sometimes does in tabes; but in the cervical cord of XI. the postero-external columns were scarcely at all involved.

The *Lateral Pyramidal Tracts* are reported sclerosed throughout nearly their whole length in 11 cases; and possibly the disease was overlooked in the remaining one for reasons already given. The degree of degeneration in sectional area in these cases varies considerably. In II. and III. only the portions adjacent to the posterior horns were affected throughout the cord, and in the latter the change could only be detected by the mi-

croscope. The degeneration in IV. occupied merely the posterior parts of the lateral tracts, but reached quite to the periphery, while nearly the whole length and sectional area were sclerosed in V. Case VI. is described as resembling IV. In VII. the degeneration was situated at the junction of the anterior and posterior horns, and reached the periphery in the lumbar cord only; VIII. exhibited more sclerosis in the dorsal than in the lumbar region; it was especially well marked in IX. in the cervical swelling, and in X. in the dorsal cord; while in XI. and XII. it seemed to decrease from above downward, and at any rate was less marked in the lumbar portion.

A very important feature is still to be remarked, namely, that in 7 cases (IV., V., VI., IX., X., XI., XII.) the diseased portion of the lateral tracts did not immediately join the posterior horns; but was separated by a band of healthy white tissue. No direct statement is made concerning the matter in II., III., and VII., but it would seem that no such band existed in these cases, and it was clearly absent in VIII.

The *Direct Cerebellar Tracts* would appear from descriptions and drawings to have been more or less involved in 7 cases (IV., V., VI., VIII, X., XI., XII.) throughout all or nearly all of their length, with a greater or smaller sectional area of degeneration.

A *Peripheral Degeneration* passing forward from the sclerosed cerebellar tracts has been described in 5 cases, viz., IV., VI., VIII., X., and XI. An excellent example is the case of Gowers' and Pitt's (X.), in which it was well marked, and extended even along the anterior median fissure from the cervical to the upper dorsal region, though below this point it was irregular and

slight. In IV. it was to be seen only in the cervical cord, and in VI. the position was the same, but the zone of degeneration was not so complete, and did not extend so far forward. Gowers figures slight peripheral sclerosis in the lumbar cord in a section which he examined from Smith's case (VIII.). Case XI. had but a partial development of this sclerosed zone, and only in the upper cervical region.

The *Anterior Pyramidal Tracts* were sclerosed to some extent in 6 cases (IV., V., VI., VII., VIII., X.). In IV. and V. the degeneration extended downward on the right side into the dorsal region, and in VI. both sides were irregularly sclerosed from the decussation downward. Case VII. showed irregular degeneration on both sides, chiefly in the neighborhood of the anterior cornua; in VIII. there was a bilateral sclerosis in the dorsal region; and in X. from the upper dorsal cord upward.

Changes in the *gray matter* are reported as follows:

The *Columns of Clarke* were found to be degenerated in 8 instances, viz., II., IV., V., VI., IX., X., XI., XII. Friedreich makes no reference to them in I., II., and III.; but Schultze found the degeneration years later in II.; and perhaps could have detected it in I. and III. Brousse (VII.) does not speak of the condition of gray matter. Smith (VIII.) says that the nerve cells of the posterior cornua were at all levels far less numerous than usual, and in this statement probably includes Clarke's columns, which would increase the number of cases to 9.

Other changes in the gray matter were sometimes seen. Thus in II. there was sclerosis of the middle and posterior portions from the cervical enlargement to the mid-dorsal region, and even the anterior horns were affected to

some extent. In IV. there was diminution of the volume of the gray matter, especially evident in the cervical enlargement. In VIII. the cells of the anterior horns as well as of the posterior horns (see above) were diminished in number. There was degeneration between the anterior and posterior horns in IX.; and in X. portions of the posterior horns were affected in some sections. Inflammation in and about the central canal was seen in Cases II., VII., and VIII., where the canal was filled with small round cells; and in XI., in which it was found obliterated in most sections. Supplementary canals have also been noticed in rare instances. In VIII. a small channel of this nature was situated a little posterior to the main tube, and extended throughout nearly the whole lumbar region. In X. there were 2 canals not more than 1 inch in length, lined by columnar epithelium, and situated one behind the other in the central portion of the cord at the decussation of the pyramids, thus taking the place of the usual single central canal. In III. there were 2 supplementary canals, about 1 line in diameter, beginning at the lumbar swelling and extending half way to the cervical enlargement. They were situated one on each side, chiefly in the gray matter, at the junction of the posterior and anterior horns, and were filled with a clear fluid. In the upper half of the cord they were represented by foci of gelatinous material occupying similar positions, and downward in the lumbar enlargement some traces of these were found.

Nerves.—*The posterior nerve roots* were sclerosed in all the cases, and in general extensively, as in VIII., where there was scarcely a fibre not degenerated. In a few cases the sclerosis was less severe, as in VII., where

the nerve roots were only affected in the lumbar region; and in X., where only some of the fibres were diseased. Some strands of the *anterior nerve roots* were sclerosed in VIII.; slight changes were found in the *sciatic*, *crural*, *brachial*, and *hypoglossal nerves* in I.; and the *median* and *sciatic* were somewhat degenerated in XII.

Histology.—The histological nature of the changes found in the spinal cord is described by Friedreich as simple sclerosis; an overgrowth of the neuroglia at the expense of the nerve fibres. A finely fibrillated or granular tissue develops, traces of the nerve fibres are scarcely to be found, corpora amylacea are frequently very numerous, and the large cells of the gray matter shrink and lose their processes. In Case III. the lateral columns underwent a simple softening instead of the usual sclerotic change.

Pathology.

The nature of Friedreich's ataxia and its position among other diseases have been matters of considerable discussion. Friedreich, Erb, Möbius, Carre, Ormerod, and Grasset classify it as a variety of tabes only. In fact, Eulenburg, Topinard, and Carre do not distinguish it at all from this affection, and the last two writers include Friedreich's cases in their works on locomotor ataxia. Friedreich, however, would seem to separate it from locomotor ataxia rather more sharply than do the others. Bourneville considered it a combination of tabes and disseminated sclerosis. There are, indeed, clinical reasons why the belief in its intimate connection with disseminated sclerosis could be entertained, for many of the symptoms, especially in some cases, are

strikingly similar, yet none of the autopsies which have been made reveal any instance of lesions *en plaques*. Friedreich's ataxia certainly belongs to quite another group of diseases, while both anatomical and clinical symptoms distinguish it also from tabes. Hammond was of the opinion that the ataxia was caused by cerebellar disease, but this is entirely unconfirmed by the results of post-mortem examinations; and though Vizioli, Galassi, and Musso agree with him regarding its cerebellar origin, they do not consider it due to disease of the cerebellum, but to interference with the innervation from this centre in its descent through the diseased cord. They entertain the view expressed by Seppilli, Brousse, and Charcot, and probably most generally held, viz., that Friedreich's ataxia is a distinct, independent affection. It is placed by some writers intermediate clinically between tabes and disseminated sclerosis, but more exactly by Gowers between tabes and ataxic paraplegia. The early age at which it appears led Friedreich to the conclusion that there existed a congenital disposition to it; that there was an hereditary arrest of development of the spinal cord *in toto;* and that the poorly developed organ was readily attacked by a sclerosing process. This same view is adopted by Schultze, Möbius, Vizioli, Musso, and others.

The question as to the primary lesion is an exceedingly interesting and difficult one. Friedreich says that the nature and position of the anatomical changes render it certain that the spinal disease cannot be secondary to an alteration in the medulla, or *vice versa;* and, basing his belief on the first 3 autopsies, he claimed that the meningitis was the primary cause and that other lesions were secondary to this. After the autopsy on

Friedreich Suss (IV.), however, he concluded that the degeneration of the posterior columns in all his cases wss primary, but that the disease of the lateral columns, and in IV. of the peripheral zone, was secondary to the meningitis which the posterior sclerosis had set up. Smith entertains the same opinion, though claiming that the secondary inflammation is not of a diffuse nature. Brousse maintains that the posterior sclerosis is primary and systemic, and that extension from it occurs in two ways: the one by means of the inflamed central canal, the other peripherally by a leptomeningitis; the disease of other parts of the cord being secondary and diffuse. Schultze considers the affection in Cases IV. and VI., which he examined, to be a degenerative atrophy of the entire posterior half of the cord, with certain slight exceptions, and claims that though the distribution of the sclerosis is too regular for disseminated sclerosis, it is too irregular for a genuine systemic disease. Kahler and Pick think that it is not an arrested growth of the cord *in toto*, but rather an imperfect development of the fibres of certain nervous systems which is the primitive cause of the disease. This development ceases at about the time of the sheath formation, and is induced by hereditary influences; and later in life, under the action of some agencies unknown to us, degeneration takes place in these imperfectly formed fibres. These authors were, I think, the first to assert that Friedreich's ataxia was a hereditary combined systemic disease of the cord—*i. e.*, a simultaneous and independent degeneration of two or more systems of nerve fibres. They regard the peripheral degeneration as a later and accessory change, perhaps due to a subsequently developing chronic meningitis. Rütimeyer adopts the same view regarding

both the nature of the disease and the origin of the peripheral sclerosed zone, and Erlicki and Rybalkin claim that the post-mortem lesions in their case can only be accounted for by admitting the presence of a combined systemic spinal disorder. Pitt proposes a very rational theory which well explains the arrested development of the cord *in toto*, and at the same time harmonizes with the views of Kahler and Pick. He believes that the general or partial smallness of the cord is congenital, being a consequence of an inherited tendency to early vascular degeneration. The posterior columns, being naturally the most vascular, of course suffer the most, and are the most diminished in size. The earliest histological changes consist less in an excessive growth of neuroglia than in an imperfect development of the medullary sheaths, followed later by a degeneration; the first cause being probably an endarteritis. These views necessitate the belief in a systemic degeneration of various parts of the cord, and are sustained by the fact that the tracts most sclerosed correspond very nearly to those which are the last to acquire medullary sheaths in fœtal life; and further that puberty or an acute illness, with the vascular changes which accompany both, often precipitates or accelerates the development of the symptoms of the ataxic disorder. Again, it is impossible in Cases X. and VII. that the affection could have spread from a meningitis, in spite of the peripherally sclerosed zone in the former, since no meningitis existed, and in IX. too, it did not pass beyond the surface of the posterior columns; and on the other hand, the 7 instances in which there was a band of healthy tissue in the lateral tract adjacent to the posterior horn confute the supposition that in these,

—the majority of cases,—there had been an extension of degeneration by contiguity from tract to tract, or through the posterior horn to the lateral tract. Therefore, although more autopsies are needed to settle the question positively, the evidence is strongly in favor of the view that Friedreich's ataxia is a combined systemic spinal disease, at least for certain parts of the cord. Whether there may also occur in some instances a diffuse secondary inflammation of other districts does not seem so clear, though it is possibly the case.

The cause of the bulbar symptoms cannot be satisfactorily explained by any of the pathological lesions yet discovered. The usual absence of pain and of diminution of cutaneous sensibility is likewise not easy of explanation. There is reason to believe that these disturbances are not connected with involvement of the exterior portion of Burdach's columns, as has been supposed, since in certain cases, as IX., the whole transverse section of the posterior columns was sclerosed, yet the cutaneous sensibility was unaffected. Rutimeyer advances the theory that they depend on disease of the boundary layer of the posterior horn (*Rand Zone* of Lissauer), since in his 2 autopsies this zone was unaffected, while in tabes its involvement is one of the most characteristic changes in the gray matter. Gowers states that Friedreich's ataxia differs anatomically from ataxic paraplegia in the greater degree of affection of the posterior columns in the lumbar region, and in the involvement of the posterior nerve roots. It is on this account that the exaggerated knee-jerk and ankle clonus are absent in the former and present in the latter disease.

Diagnosis.

The recognition of Friedreich's ataxia is not always easy; the principal and usual conditions on which a diagnosis may be based being, 1, the evidence of some hereditary influence; 2, the occurrence of several cases in a family; 3, the early age at which the symptoms appear; 4, the presence of motor ataxia spreading from below upward; 5, static ataxia in more advanced cases; 6, affection of speech; 7, nystagmus late in the disease; 8, talipes; 9, curvature of the spine; 10, frequently paralysis late in the disease. Negative symptoms are the absence, 1, of patellar reflex; 2, of marked sensory lesions, at least early in the disease; 3, of decided trophic lesions; 4, of affection of intellect; 5, of affection of the optic nerve; 6, of visceral or vaso-motor disturbances. But some of these symptoms may be absent in certain cases, and others may appear which suggest the presence of some other affection; so that in this, as in all diseases, the diagnosis must be based on the aggregation of symptoms rather than on individual ones. (For anomalous cases see Remarks on Table I.)

Clinically, Friedreich's ataxia is most closely allied to tabes dorsalis, disseminated sclerosis, and ataxia paraplegia.

Uncomplicated *tabes dorsalis* rarely appears before the age of 25–30, and the cases occurring during childhood are of the utmost rarity, if, indeed, genuine. It exhibits neither incoördination of speech nor nystagmus; though lesions of the optic nerve, affection of the pupillary reflex, and other disturbances connected with the eye are frequent and early symptoms. Severe pain is one of the first and most common signs of the disease;

other affections of sensation are usual and appear early; and visceral and atrophic affections are generally present. The gait of tabes is peculiar; the feet being projected too far forward, while in Friedreich's ataxia the projection is often more lateral, and the gait is oscillating, as has been described. Charcot says that "static ataxia" is rarely seen in tabes.

Disseminated sclerosis, whose symptoms still more nearly resemble those of Friedreich's ataxia, usually develops after the age of 20, though it may appear in infancy. The influence of heredity is exceptional, and the progress of the disease is not infrequently marked by remissions which seem almost like recovery. Nystagmus and affection of speech are common to both disorders, but in disseminated sclerosis the former is usually more extreme than in the other disease, and is not simply "ataxic nystagmus;" while the speech is typically scanning—a feature which may or may not be present in Friedreich's ataxia. Some of the more distinguishing symptoms of disseminated sclerosis are the exaggerated knee-jerk, ankle clonus, rhythmic oscillations, violent jerking movements, intention tremor, rigidity and spastic paraplegia, disturbance of intellect often with epileptiform and apoplectiform attacks, and the absence of Romberg's phenomenon. These symptoms either do not occur at all in Friedreich's ataxia, or are seen only exceptionally.

Ataxia paraplegia develops, according to Gowers, between 30 and 40 years of age, and does not occur in several members of a family. The knee-jerk is exaggerated, and there is no nystagmus. Marked affection of speech is wanting, though there is sometimes slight defect in articulation.

Of the other diseases with ataxic symptoms, *cerebellar tumor* can hardly be confounded with the disease in question. The gait is "drunken," and resembles many cases of the spinal disease; but there is no involvement of the arms, and the tendon reflexes are present; while tumor also produces headaches, optic neuritis, vomiting, epileptiform attacks, and marked vertigo. Certain instances of Friedreich's ataxia exhibiting excessive static ataxia or choreiform movements, as in Sinkler's last 3 cases (137, 138, 139), might raise the question as to the diagnosis of the affection from *hereditary chorea*. This disorder, however, is distinctly hereditary (direct similar inheritance) for generations, and without a break; nearly always appears after the age of 35–40 years; has no truly ataxic symptoms, and is almost invariably sooner or later associated with severe disturbances of intellectual power with a tendency to suicidal mania. There is, further, no diminution of the patellar reflex.

Duration, Prognosis, Treatment.

Duration.—The course of Friedreich's ataxia is steadily onward, and though there frequently occur periods during which no decided progress of the disease can be detected, yet improvement in the symptoms rarely takes place. This is the opinion generally accepted, and I recollect but 3 cases—one of Smith's (100), one of Teissier's (60), and that of Leubuscher—in which notable improvement was observed. In Teissier's case the symptoms largely disappeared during 2 years, and then returned; though not to so great a degree up to the time when the case was last examined. The dura-

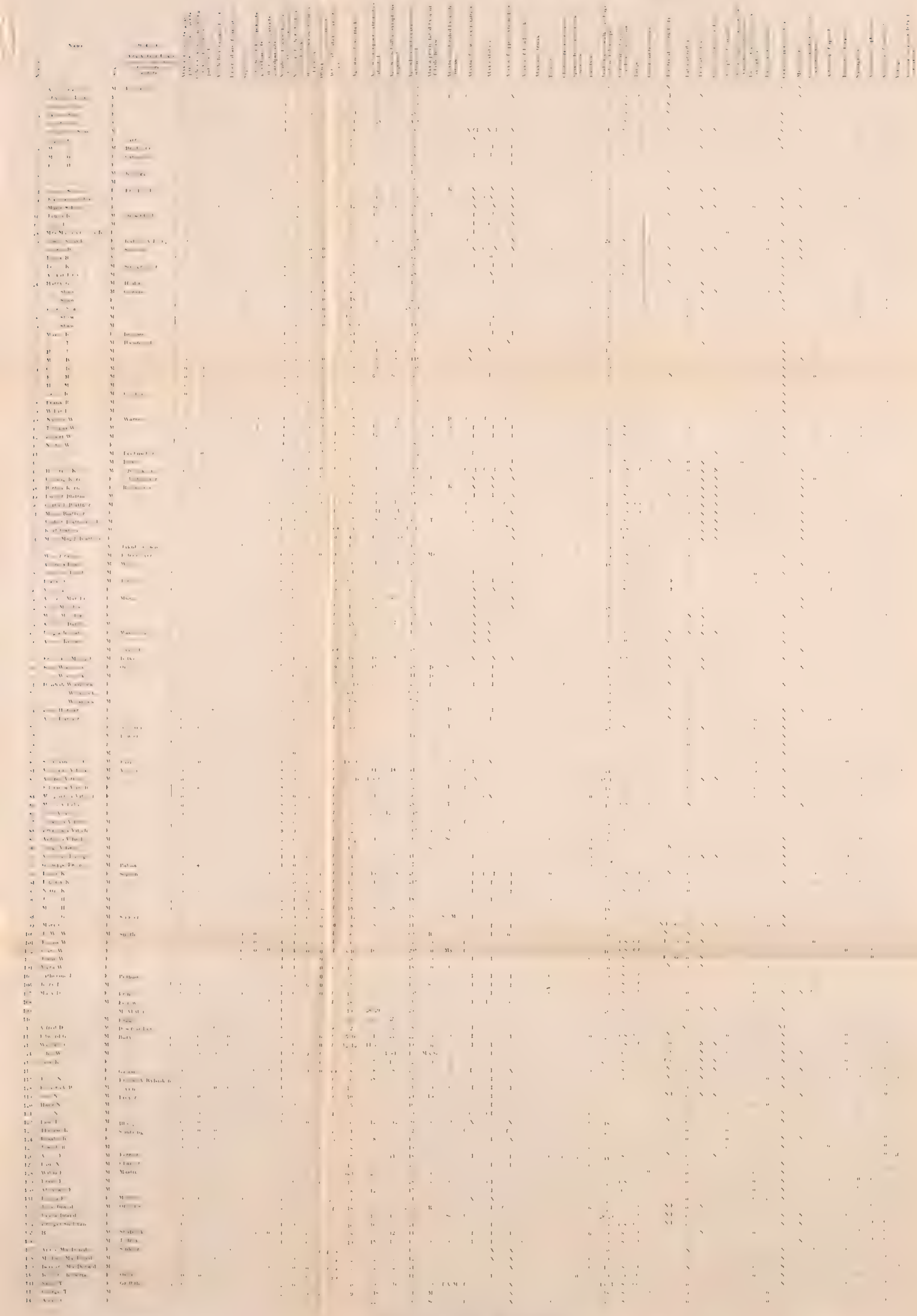
tion of the disease is very extended, unless it be terminated by some intercurrent affection. Many patients are able to follow their avocations for years, with very little increase in the severity of the symptoms. 2 of Friedreich's cases (2 and 5) were ataxic 34 and 27 years respectively, and died finally of typhoid fever. One of Smith's cases (101) has had the disease 31 years; one of Stintzing's (123) 28 years; and one of Vizioli's (81) 41 years. But the longest duration reported is in another patient of Vizioli's (87) where the ataxia lasted from birth till he died at the age of 46. On the other hand, some cases have grown rapidly worse, and have died with advanced symptoms in but a few years from the onset. One of Hammond's cases (33), for example, suffered but 8 years; 2 of Coleman's patients (38, 39) never walked, and died at 3 years of age; and the other (37), as well as a case of Vizioli's (88), died at 6 years, and like the others had never walked. As far as I have been able to discover, 25 of the cases in the table are reported by the observers to have died. 5 of these (1, 3, 4, 6, 14, 38) are said to have died of typhoid fever; 1 (117) of typhoid fever and phthisis; 2 (19, 107) of phthisis; 1 (38) of some pulmonary affection; 1 (2) of nephritis; 1 (30) of apoplexy; 4 (5, 33, 34, 94) apparently of advancing weakness; 1 (46) of fatty heart; 1 (27) of fibroid heart; 1 (102) of acute myelitis; 1 (86) of "taking cold;" and 1 (88) of diarrhœa. In 1 (48) the cause of death is not clear, and in the remaining 4 (37, 39, 87, 128) there is no intimation given as to its nature.

Prognosis.—It will be seen from what precedes, that the prognosis is usually favorable as regards the duration of life, but most serious as regards recovery from

the disease. The patient will die of the progressive weakness in the course of Friedreich's ataxia, if not carried off by some intercurrent affection. How soon the habits of life will be seriously interfered with, and when the lethal *exitus* will probably take place, must be determined for each individual patient, by considering the former rapidity of progress in that particular case.

Treatment.—Treatment has proved unavailing in almost all cases. One of Teissier's patients (60) improved greatly, apparently through better hygienic surroundings. One of Smith's cases (100) improved temporarily under the use of nitrate of silver. This drug naturally suggests itself, and has, indeed, been used in a number of other cases, but without any decided benefit. Arsenic, phosphorus, iodine, zinc, may also be tried, and cauterization over the vertebral column has been proposed. The constant current applied to the spine seemed to be of benefit in Leubuscher's case. One of the chief indications is to sustain the general nutrition by tonics, iron, cod-liver oil, change of air, salt and other bathing, etc., and to stimulate by electricity and massage muscles which are apparently beginning to lose power. When the spinal curvature and the lack of control of, or lack of power in, the dorsal muscles render the patient unable to sit upright, a plaster jacket may be applied with great advantage. I have found this give great relief to one of my own patients (142). Case 102 (Smith's) also improved surprisingly under electrical treatment and the employment of a plaster jacket.

TABLE I.—OBSERVED AND REPORTED CASES ARRANGED CHRONOLOGICALLY



EXPLANATION OF SIGNS USED IN TABLE I

Remarks on some of the Cases in Table I.

I have already stated that I do not by any means consider that all the cases in the table are undoubted instances of Friedreich's ataxia, but that all of them have at least some claim to be considered such. The cases about which doubt has been or might perhaps be entertained are 7, 8, 11–12, 16–18, 19, 22–23, 31–36, 37–39, 55–56, 60, 68, 100, 108, 109, 111, 114–115, 117. Most writers have no question concerning Case 7 (Carre), but a few—*e. g.*, as Seeligmüller—doubt its genuineness chiefly on account of the very marked degree of initial and later pain. 8 (Bradbury) is not admitted by Bury, but has, I think, a good right to a place with other cases. Kellogg's cases (11–12) are not as well reported as could be desired, and are on this account excluded by many tabulators, but included by the Italian writers and by Bury. There seem to be good reasons to consider them genuine. Dreschfeld's patients (16–18) are certainly questionable, and some of them resemble tabes very greatly. They are tabulated by Ormerod, but rejected by Smith. The fact that there were 5 attacked in one family is their greatest claim for membership among this class of cases. Most authorities do not hesitate to call 19 an instance of Friedreich's ataxia, though Rütimeyer questions it, and Gowers assigns it to ataxic paraplegia. 22–23 (Seeligmüller's) are excluded by many writers, but considered genuine by Smith, Vizioli, Prince, and others, with whom I am disposed to agree. Hammond's cases (31–36) are so briefly and imperfectly described that Smith rejects them altogether, and they are very generally called in ques-

tion by European writers, though tabulated by Ormerod and Vizioli. Careful reading "between the lines" of the author's report renders it probable that they are genuine, as he claims. 37–39 are also most incompletely described, but information received from Dr. Coleman through Dr. Smith renders it at least possible that they are instances of this disease, and I feel therefore obliged to place them in the table. There certainly appears to be no other affection to which they can be so well assigned. Jakubowitsch's case (55) is by no means typical, and is excluded by Bury; yet it seems to accord with the symptom-complex of Friedreich's ataxia better than with any other disease. Erlenmeyer's case (56) most probably belongs here, and Rütimeyer is of the same opinion, though Friedreich and Erb were opposed (see "choreiform movements"). The girl (60) described by Teissier might be excluded from the list on account of the improvement in the symptoms, had not her brother (59) been a well-marked case of the disease. 68 is a very anomalous case and might possibly be disseminated sclerosis; but the distinct hereditary and family history strengthen Botkin's claim that it was Friedreich's ataxia. He believes that accidental focal lesions may also have existed. The age of the patient and some of the symptoms lead Gowers to relegate 100 to ataxic paraplegia. Considerable correspondence with Dr. Smith as to the course of the case since it was reported, leads me to place it in the table. 108 is a very doubtful case, but not sufficiently so to nullify Fellows' claim that it is an instance of Friedreich's ataxic. The report is most incomplete. 109 (McAlister's) is a case included in this class by Bury, but of which an exceedingly imperfect account is pub-

lished. Descroizilles' patient (111) had some symptoms much like disseminated sclerosis, though it very probably belongs to Friedreich's ataxia. Bury hesitates to call 2 of his own cases (114–115) instances of this affection, on account of the absence of a history of heredity. They seem in other respects to be good examples of it. Erlicki's and Rybalkin's patient (117) has already been referred to under "Pathological Anatomy."

Table II.—Additional List, arranged Chronologically.

A. *Reputed cases, related by blood to those in Table I., but not under professional observation.*

Reporter.	No.	Relationship to cases in Table I.
Carre,	17	Grandmother, mother, 8 uncles and aunts, 6 brothers and sisters and a cousin said to have similar symptoms.
Bradbury,	2	Mother and brother similarly affected.
Carpenter,	1	A third member of the family later became ataxic.
Kellogg,	3+	A brother, aged 5–6, and several cousins ataxic.
Dreschfeld,	2	A brother attacked at 19, and a sister at 21 years of age.
Seeligmüller,	1	A sister, aged 21, possibly affected.
Brousse,	1	The mother had the same disease.
Power,	2	A brother attacked at 15, and a sister at 17.
Rütimeyer,	3	Great-great-great-grandfather said to have been ataxic; 2 brothers of Case *54* showed the first symptoms in their 4th year.
Musso,	3	Possibly the great-uncle had the same disease; 2 brothers of Case *64* were certainly affected.
Botkin,	2	Father and a brother said to have had similar symptoms.
Ormerod,	2	Grandfather of Cases *69–73* reputed ataxic. Brother of Cases *74–75* attacked at age of 13
Fowler,	1	Father said to have had a peculiar gait; possibly the same disease.
Fazio,	2	2 brothers with the same disease.
Vizioli,	1	A sister of Case *91* died at 5 years of age with all the symptoms of Friedreich's ataxia.
Seguin,	1	A sister attacked at 15 years of age.
Smith,	1	A sister attacked at 6–7 years of age.
Fellows,	2+	Several members of the family are said to be similarly affected.
Bury,	1	Grandfather of Cases *112–113* probably had an ataxic gait, and may have had the same disease.
Stintzing,	1	A brother died at 31 with the same disease from which the others of the family suffer.
Mastin,	3	2 uncles attacked at 15 and 12–14; and a cousin at 9 years of age.
Mendel,	1	A brother died at 4½ with symptoms of Friedreich's ataxia.
Shattuck,	2	A brother attacked at 7, and a sister at 5–6 years of age.
Joffroy,	1	A sister affected at 12.
Griffith,	1	A brother of Case *143* died at 9 with symptoms of the disease.
	57+	

B. *Possible and probable cases; under observation and reported, but without description.*

Reporter.	No.	
Eulenburg,	3	Mentions a case of "locomotor ataxia" under 10 years of age, and 2 under 20; both illustrating heredity. Are very possibly instances of Friedreich's ataxia, as the author does not distinguish this affection from tabes.
Duchenne,	3	Says he saw with Trousseau 3 brothers attacked by ataxia.
Vulpian,	?	Says he has seen cases analogous to those mentioned by Duchenne.
Schultze,	1	Reported a case briefly before the Wanderversammlung der Südwestdeutschen Neurolog. u. Irrenärzte; but I can find no description of it.
Putnam,	2	Saw 2 separate cases which he believes to be of this type, though no others of the family were affected.
Goodhardt,	2	Saw an ataxic child with an ataxic father. No detailed description. They may be instances of Friedreich's ataxia.
Ormerod,	4	2 cases of this disease, brothers, were shown him by Dr. Hughlings Jackson. Also saw a sporadic case under the care of Dr. Jackson, and another under that of Dr. Gee.

C. *Too doubtful cases; claimed as cases by those reporting them, or by others, but probably without good reason.*

Reporter.	No.	
Bouchut,	2	A boy of 11 and a girl of 14 are reported by the author as examples of locomotor ataxia. They are occasionally supposed to be Friedreich's ataxia, but are very properly rejected by nearly every writer on the disease.
Hitzig,	3	The author rather intimates that these cases belong to progressive muscular atrophy. Kahler and Pick suggest that the disease may have been Friedreich's ataxia, but it does not seem clear on what grounds, except that the mother was tabetic.
Fellows,	1	A case described as Friedreich's ataxia, but without, I think, any claim to be considered an instance of it.

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REPORT AND EXHIBITION OF FOUR CASES OF FRIEDREICH'S DISEASE.

By
WHARTON SINKLER, M.D.

[Read February 1, 1888.]

Case I.—Mary G.; aged fourteen years. She is one of five children; the others are healthy. Her parents have no nervous affection. Her trouble began when she was eight years old, with awkwardness and incoördination. These symptoms have increased, and she has now great difficulty in walking or standing. The hand movements are ataxic. When the eyes are closed she has greater difficulty in guiding her finger to any given point. Knee-jerk absent on both sides; pupillary reflexes good for light and accommodation; horizontal nystagmus in each eye; visual fields contracted. The history of this case, with a full report of the ophthalmic symptoms, by Dr. Charles A. Oliver, can be found in the Philadelphia *Medical News*, July 4, 1885.

The three other cases were two brothers and a sister.

Case II.—Annie M.; aged fifteen; a bright and intelligent looking girl; had when three years old what her mother called a stroke; seems to have been paralyzed for some months; gradually improved and became able to walk six squares to school; when getting better of the paralysis began to have irregular movements. About five years ago she had a bad fall, and has been getting worse ever since. She has never talked distinctly. Began to menstruate at fourteen years.

Status præsens: She has slow, irregular movements of the head; occasional choreiform movements of the facial muscles. A distinct, though slight, lateral nystagmus is present; speech hesitating and drawling; hands lie quiet. She can pick up objects fairly well. Threads a needle, but with difficulty. All the movements of the arms are accomplished with irregularity; stands badly with the feet together; walks with the feet wide apart, and sways very much; gait very staggering and irregular; knee-jerk present; no pain or loss of sensation; general health good, and is intelligent.

Case III.—Michael M.; aged twelve; brother of Annie M. The disease began at about the second year. His mother first noticed a tendency to bend the head back; then movements of the arms began. Learned to talk fairly well.

Status præsens: Slow lateral movements of the head are continuous. When asked, moves the head freely in any direction. Slight choreiform movements of the facial muscles; hands remain quietly in lap; the fingers twitch slightly; can pick up a pin with either hand; grip of both hands good. Distinctly ataxic movements when he attempts to touch the nose or to meet the tips of fingers together. There are occasional slight movements of the legs when at rest; stands with feet far apart and knees flexed; sways greatly; back is curved, and all muscles are in use to preserve equilibrium. When looking upward, or eyes closed, no change occurs. Gait extremely ataxic; legs are thrown about, and he staggers from side to side; knee-jerk slightly exaggerated, but no ankle clonus is present. Tongue is protruded straight. There is slight lateral nystagmus; speech is distinct, but drawling.

Case IV.—Bernard M.; a pale, poorly developed boy; much more helpless than his brother. The disease began gradually at about three years.

Status præsens: Almost constant movements of head from side to side and up and down, but with a general tendency to drop forward. Constant and marked choreiform movements

of facial muscles. Under lip often drawn in below the upper teeth; lateral nystagmus; speech very slow and indistinct; words are jerked out in an explosive manner. Movements of arms and hands constant; grasp of hands remarkably good; can pick up a pin, but with some trouble. Any attempt at voluntary movements increases the choreiform movements of the whole body and limbs. For the past year he has been unable to stand, but can walk if supported, but can make only a few tottering steps. He cannot sit upright; body being bent forward. Feet are extended, talipes equino-varus position. Irregular movements in legs and feet; knee-jerk present; no clonus; sensation preserved.

In all of these three last cases the movements cease completely during sleep. The boys can neither read nor write, but they seem to be bright and intelligent children. They are very good tempered and enjoy good general health.

The parents of these children are living, and are in excellent health. No chorea or epilepsy can be traced in either father's or mother's ancestors, nor is there any history of phthisis. There have been nine children born to the parents, of whom seven survive. All except the cases above related are quite healthy.

NOTE ON A CASE OF FRIEDREICH'S ATAXIA, WITH EXHIBITION OF PATIENT.

By

WILLIAM OSLER, M.D.

[Read February 1, 1888.]

Blanche R.; aged eleven; third child in a family of five. Parents are healthy and intelligent, with no history of nervous or mental affections in the family. With the exception of the patient the children are all strong and well. As an infant she was healthy, but when two years old she had a fall and struck the head with such severity as to cause the blood to flow from the nose, ears, and eyes. She was, however, conscious when picked up, and within a few days seemed as well as ever. At this time she was walking about, and had begun to talk, but at the end of her third year it was noticed that she was unsteady in her gait and inclined to stagger, and would fall forward or backward. The head also shook, and the speech became indistinct. She also did not use her arms so freely. This condition has been steadily and progressively growing worse. She had scarlet fever and diphtheria at her eighth year. She has grown and thriven fairly well.

Present condition: Patient is of average size for her age; looks intelligent; the head presents peculiar movements, chiefly lateral and forward; there is a peculiar expression about the eyes, which follow the finger with slow uncertain movements; there is no positive nystagmus. The pupils are of medium size. It is difficult to get any reaction on accommodation. She sits with her head bent forward, and with the trunk stooped. The

hands are kept quietly in the lap, but there are slight twitchings of the fingers at times, and also of the shoulders and of the elbows. On attempting voluntary movement there is marked ataxia in the arms; she can scarcely get a glass of water to her mouth on account of the irregular movements. She touches her nose and ears with difficulty. She sits with her feet inverted; stands with her legs apart. She sways at once if she shuts her eyes. There is no impairment of muscular power in the legs. The gait is distinctly ataxic. She walks with her feet far apart and looks down. Sensation in the arms and legs is good. The special senses are unimpaired; knee-jerk is difficult to obtain; speech is slow and indistinct. She understands everything that is said to her. There is no curvature of the spine.

[After the reading of the preceding papers, Dr. W. Everett Smith, of Boston, was invited by the President to take part in the discussion, he being the first in this country to report a case of Friedreich's ataxia.]

Dr. W. Everett Smith said: Mr. President and gentlemen, I thank you sincerely for your cordial greeting to me in Philadelphia, and wish especially to remember Dr. Osler, through whose kind invitation I am with you to-night. But I can hardly let the very flattering statement that I was the first in this country to report a case of this disease pass without mention. It is true that I have the privilege of being the first and only one in this country to report a single family in which so large a number of ataxics as six have occurred, but as regards mere priority, Dr. Kellogg, of Michigan, published two cases which I think were unquestionably of this variety of ataxia, and Dr. W. C. Warren, of Mississippi, mentioned three cases, which probably would come under the same head, some years before I reported my patients.

After the very able paper of Dr. Griffith, to which we have just listened, it might seem a work of supererogation for me to make any remarks at all; yet perhaps one or two points might be brought out clearly and emphasized without a waste of time. In addition to the three distinctive symptoms of, first, early onset of the disease; secondly, family character of the affection; and thirdly, absence of sensory derangements, we ought to notice that in every case there is a marked curvature of the spine, a curvature which is in most cases double—*i. e.*, both forward and lateral. The symptom of nystagmus is one which appears only late in the history of the disease, and its absence need not tell in any way against the diagnosis.

In regard to the age at which the onset of the symptoms has been supposed to begin, although it was stated by Friedreich to be marked by puberty, and although in the cases since reported it has been considered to be no later than five or seven years, it seems to me, from my own cases and the studies I

have made of others, that the symptoms really begin even earlier than this. Indeed, such a belief would fall into line with the idea that the disease is due to a lack of development of nervous centres. And I am inclined to the opinion that in many cases the disease has existed from the very time of birth; that the children were never as free as others in their movements, but that the parents have failed to notice the symptoms until the age is reached when the children would naturally romp and play; and perhaps not until some acute disease has so weakened the system, or until the extra demands of puberty have allowed the incoördination to make such advances that it can no longer possibly pass unobserved. In regard to five of the six cases that I have recorded, I am credibly informed by their mates who were with them in the lowest grades of school that they never walked and acted as other girls, and I feel confident that in these cases, at least, the symptoms of ataxia were always present.

Seeing, then, that the symptoms of this family ataxia differ so markedly from those of locomotor ataxia, it does not seem in the least strange that investigators should claim that the diseases are radically separate. But the assumption of Hammond that the family ataxia of Friedreich is dependent upon a degeneration of the medulla and cerebellum does not seem to be supported by an actual study of the pathology revealed by autopsies that have been made. The fact is, the medulla and cerebellum have been found affected only very rarely and very slightly. Brousse lays considerable stress upon the great quantity of cell accumulation in the central canal of the cord, and considers that this infiltration is the means by which the disease spreads from the posterior to the lateral columns, making thus the affection of the latter a secondary process. It is true that this abnormal cell-production has been pretty constantly observed in the few autopsies that have been made, and that it is particularly noticeable in the sections from my autopsy, but I do not feel so sure that it is the *cause* of the spread of the degeneration. Nor can I in any way agree with Vulpian, Charcot, and Bourneville, who claim that the disease is only a form

of disseminated sclerosis. It seems to me, on the contrary, to be clearly a systematic degeneration of the cord, but at the same time a degeneration which can be divided into a primary and secondary form; primary as regards the posterior columns and secondary as regards the lateral columns. And I am strengthened in this opinion by the fact that the posterior columns are more affected in the lumbar and lower dorsal regions, while the lateral involvement is more in the cervical and upper dorsal.

In the case, moreover, in which I made my autopsy, and of which a specimen from the lumbar region is under the microscope upon the table, it will be seen that the cord is not only smaller than normal, but that it is markedly flattened upon one side of its posterior aspect. Another very distinctive point is the lack of any degeneration at the apices of the posterior columns. They have curiously, but invariably, escaped in all the sections that I have examined.

I have often thought that confusions may possibly have crept into the diagnosis of this disease because of its association by name with locomotor ataxia, and I am strongly of the opinion that diseases in general ought, for the sake of clearness and exactness, to be designated according to their pathological lesions. I suggest, therefore, the term Posterior Lateral Spinal Sclerosis as an appropriate name for the disease under consideration, although I am not prepared at this time to say whether it is the best that can be adopted.

REPORT OF THREE CASES OF INSANITY.

By

JOHN B. CHAPIN, M.D.

[Read March 7, 1888.]

I. Traumatic Mania; Cataleptoid Symptoms; Recovery.

Sudden delirium, temporary unconsciousness, and mental hebetude may be the immediate consequence of concussion and jarring of the brain, or a gradual alteration of the character of the individual with permanent enfeeblement may be a more frequent remote sequence—conditions that are sometimes presented to the courts to determine a question of criminal responsibility or consequential damages.

The case I am about to report has seemed of sufficient importance to have a place in your proceedings for two reasons: first, it is exceedingly rare that an injury or jarring from a fall is immediately followed by an attack of acute mania; and, second, it illustrates the successful application of principles of treatment which are now applicable to a large range of cases of insanity.

A woman, twenty-two years of age, was admitted to the Pennsylvania Hospital for the Insane with acute mania. There was no neurotic heredity in the family. The patient

had grown rapidly, was above the average stature, of spare habit, and had been in fair health until a year prior to admission. While she had been much occupied in growing, she had been equally busy and probably strained at school with algebra, geometry, ancient history, French, Latin, chemistry, botany, natural philosophy, astronomy, and music. After the completion of the school course she complained of languor, was indifferent to her friends, had gloomy forebodings and ideas, and somewhat given to introspection. During the summer the patient went to the mountains and entered upon a course of vigorous exercise, including horseback-riding. During one of the rides, one week prior to admission to the hospital, the patient was thrown violently to the ground sustaining a severe jar, but remounted and returned to her hotel having no consciousness or recollection of the fall or the journey back. During the ensuing evening she was confused, emotional, and partially delirious during the night. The mental disturbance increased from day to day, and in the course of the week she was in a state of maniacal excitement requiring the constant personal attendance of two or three persons.

On admission to the hospital the attention of the patient could not be arrested. The conversation, partly directed to those present, was disconnected, rapid, and incoherent, and there were indications of visual and auditory hallucinations. The tone of the voice was pitched in a high key, which was a marked peculiarity throughout the active stage of the attack. There was also an extraordinary motor activity. The muscles of the arms, legs, and the body were in constant motion. There was no marked exacerbation of the pulse, no fever, suffusion of the eyes, or vomiting.

There was no reason to assume that there was any pain of the head or tenderness along the course of the spine, so that we could not conclude there was any meningeal complication.

Thus far the symptoms were not unlike those of many cases that occur in the experience of all our asylums every year. As the case progressed, however, the noise which the patient was able to make seemed to increase. It consisted of a prolonged

harangue in a very loud tone continuing with little interruption six and eight hours daily for a period of six weeks. The motor disturbance during this period showed no abatement. It consisted of constant gesticulations with the arms and legs, which seemed to be synchronous with and intended to reinforce the harangue, rendering the personal attendance of two and three persons necessary for the care of the patient.

Instead of a too rigorous restriction to the limits of a room or ward, and as the patient could not well be taken out to walk, she was placed in a carriage and driven about the grounds for an hour or more daily, and, as the season was favorable, wheeled in a chair into the open air.

As so much expenditure of nervous force must necessarily always be attended with waste of strength, in the case of our patient it was well sustained by a generous administration of food. Fortunately, whatever was offered to the patient was taken without objection. In addition to three meals daily, she took twelve to fourteen pints of milk during the twenty-four hours. At an early stage of the attack it became important to promote those physiological conditions which might induce repose and sleep. For this purpose, bromide of sodium and fluid extract of ergot were administered to the patient during the day, and at night $\frac{1}{120}$th of a grain of hydrobromate of hyoscine, gradually increased to $\frac{1}{60}$th of a grain, was added to the prescription. This combination usually resulted in producing from five to seven hours' sleep. During the day a tonic, composed of strychnia, sulphate of iron, with sulphate of magnesia and dilute sulphuric acid, was administered.

Two months after admission a decided alteration in the condition of the patient occurred. She became quiet, silent, and passive, made no response of any kind to questions, exhibited no sign of recognition of friends, and gradually passed into a cataleptoid state. The eyes were open and fixed, the arms remained stationary in any position in which they were placed, saliva and excretions were retained. The action of the heart was so feeble as to be a source of some anxiety. At this stage the narcotics and all previous medicines were

suspended, and the tincture of muriate of iron and milk punch were substituted. Faradic electricity and massage were directed, and willingly submitted to. In the course of two months a marked improvement in the patient's physical condition was noticed. There had been a gain in weight, the urine was discharged naturally, the cataleptoid symptoms had disappeared, and the menstrual function had been resumed. There had been as yet no sign of recognition of friends or surroundings, there had been no utterance of any sound or articulate word for a period of two months, and the attention could not be aroused by questions or movements.

The patient had now been under treatment four months. During the ensuing month, in the course of a visit, the hand of the patient was taken, and she was asked to return an answer to a question by a slight squeeze, but in place of the requested response there was a hearty and natural smile. From this time onward convalescence was rapid, the patient conversed and acted naturally, and was removed home at the expiration of six months after admission, in the judgment of her friends and her physicians, fully restored.

The patient while under treatment presented two opposite conditions, one of extreme mental and motor disturbance and activity, the other of physical prostration and apparent cessation of all mental action or "mentalization." The mental manifestations were remarkable rather for their intensity. They seemed to be explosions of psychic force. If we may correctly infer that psychical energy is subject to the same balances and laws of inhibition that control other manifestations of nervous force, then we may explain the intensity of mental action in this case on the hypothesis that there was a serious disturbance of the inhibitory powers due to some disturbance of the nutrition of the brain. Entertaining the opinion that the mental disturbance was the result of a functional derangement rather than due

to a structural change, a favorable prognosis was expressed.

Observations.—1. The assimilation and appropriation of the large quantity of milk, amounting during several weeks to two gallons daily, and averaging ten and twelve pints daily, in addition to eggs and other food liberally taken, was a remarkable experience. The importance of the administration of large quantities of nutritious food in the treatment of acute forms of insanity with a tendency to exhaustion is now more generally recognized and may be said to be one of the marked changes in the practice of recent years. The capacity of the system to receive and dispose of large quantities of nutriment was illustrated in another case that I may mention in this connection. A lady under my care during the past year suffering from acute melancholia with delirium, on her admission weighed sixty-two pounds. Under a process of feeding which might be called stuffing she made a gain of sixty-three pounds in five months, when she was discharged recovered.

2. The excellent results sometimes observed in the use of the hydrobromate of hyoscine were again demonstrated in the treatment of this case. In this, as well as in other critical cases, it has proved to be a reliable hypnotic. The failures of the expected results that have been reported may be attributed partly to the variable quality of the drug, and to physiological conditions not yet fully understood. Its prolonged use should be carefully watched, as retention of urine may result, as occurred in this case.

3. The success attending the use of massage and electricity in the treatment of certain nervous diseases

and in promoting nutrition, after the plan pursued by Dr. S. Weir Mitchell, has not, I think, been generally realized in the management of the insane. Success depends very much, and we might say wholly, upon the coöperation of the patient. An important element appears to be that the will of the patient should be brought wholly under the control of the physician. This we do not succeed in securing very often in mental cases, and is, I think, one of the principal causes of failure. In the case I have presented, while the patient did not coöperate she did not resist, and the treatment certainly contributed to an addition of forty to fifty pounds to her weight and indirectly to her recovery. The appearance of a cataleptoid condition, following the maniacal state, as in this case, should not be regarded unfavorably. I have been able to recall several cases of complete recovery where a similar condition had existed, and this result has been confirmed by the experience of others.

Coincident with the rapid nutrition and gain in weight that took place mental improvement commenced, although for a considerable time the unusual amount of food taken barely made good the waste that was going on. Recovery may fairly be ascribed to the general activity of nutrition that was induced in which the brain structure participated.

II. Syphilis; Acute Hernia; Recovery.

A. B., female, married, aged twenty-four, of spare habit, thin in flesh, pale, of a neurotic temperament, was received into the Pennsylvania Hospital for the Insane The patient had not been previously insane. Two paternal aunts and two

sisters have been insane. The father was called nervous and eccentric during his lifetime.

The patient was nervous, peculiar, acted strangely, spent money foolishly and extravagantly, and complained of headache for three weeks before admission. Three days before admission she became emotional, excited, noisy, violent, destroyed clothing and small articles about the house, and had tried to escape from her home. On admission the conversation was incoherent, rapid, vulgar, and profane. The habits were dirty. Refused food, and threatened suicide. Had a variety of delusions, hallucinations of sight and hearing; heard voices calling to her; said she saw her father and other relations long deceased approach and converse with her. At other times she said she was a "queen of heaven," in immediate and constant communication with God and his holy angels; said she had the future destiny of the world in her power, and could pronounce the everlasting curse upon all who were her enemies and not willing to obey her. Her manner was commanding. When addressed, her answers were not responsive to questions, and it was with difficulty her attention was aroused.

She was administered bromide of sodium, fluid extract of ergot, and compound tincture of cinchona, during the day. At night she had hyoscine $\frac{1}{120}$ of a grain, urethan twenty to thirty grains, or chloral and tincture of hyoscyamus. Under this treatment sleep improved, the head pain was less, and she became more quiet.

At the expiration of fifteen days she was administered a mixture of strychnia, sulphate of iron, and sulphate of magnesia, in combination with malt, cod-liver oil, and one of the above-named hypnotics, at night. She was administered liberal portions of milk, eggs, and a supply of extra diet. At the end of six weeks there had been a gain in weight; there was an improvement in sleep and less headache, but the mental condition had not materially changed; she was excited and excitable, profane, obscene, rubbed excrement on her person and bed, was destructive and disorderly. At this period the attention of the physicians was called to an eruption on the

legs, arms, and trunk, which, on examination, proved to be tubercular syphilides.

The patient was then placed upon iodide of potassium and bichloride of mercury. Three weeks from the time the patient began to take the medicine there was a decided improvement in the mental condition, and the eruption had nearly disappeared, and in seven weeks from the commencement of the specific course of treatment the patient was discharged, recovered. The patient was under treatment in the Hospital for five months and one day.

III. Syphilis; Dementia; Hebetude; Recovery.

A. B., male, aged thirty-four, was admitted into the Pennsylvania Hospital for the Insane on the usual certificates of insanity. He was emaciated, weighed 110 pounds. Pulse 120, feeble. There was no family history of insanity or neuroses.

His physician stated that five years ago the patient contracted syphilis, and four months prior to admission had consulted him for intense headache, which was relieved only temporarily by morphine. The physician, recognizing the probable specific origin of the headache, administered small doses of bichloride of mercury and increasing doses of iodide of potassium.

In furnishing a history of the case, the wife stated that the intense headache had been preceded by loss of flesh and a period of lassitude and reticence; that recently his speech had become thick and indistinct, and that he had become forgetful. He fell asleep easily, passing into this condition at the table and in the midst of conversation. His control over his upper extremities was quite deficient; articles grasped in his hands were held insecurely; in attempting to guide his food to his mouth it was frequently carried above or to one side. He walked with a shuffling gait, scarcely lifting his feet from the floor, tripping over slight obstructions. He stood alone with great difficulty, and showed a marked inclination

to fall backward. The patellar reflex was exaggerated. The right pupil was moderately dilated, the left widely dilated. There were nodes upon the tibiæ, and distinct tenderness over the right parietal eminence. The patient had apparently hallucinations of sight, but was too confused to give any account of his sensations or ideas.

He was placed upon a full diet with milk punch; given 20 grains of iodide of potassium and $\frac{1}{36}$th of a grain of bichloride of mercury, three times daily; the iodide of potassium to be increased in quantity from time to time; and $\frac{1}{90}$th of a grain of hydrobromate of hyoscine at bedtime.

Two days after admission the notes of the case state that he was eating well, was much stronger, but the mental confusion remained. His speech was thick and indistinct, and he failed to recognize his wife. Four days after admission he continued to eat well, the control over the extremities was better, and there appeared a little less mental confusion. He was still sleeping poorly, although the hyoscine had been increased to $\frac{1}{60}$th of a grain at night. One week after admission his weight was 113 pounds.

Two weeks following he was in an improved condition; weight had increased; his control over the limbs had much improved. He was then taking 70 grains of iodide of potassium three times daily. There was still present considerable mental disturbance. The patient was under a delusion that he was to be killed.

A month after admission the mental and physical improvement had so far advanced that patient was permitted to go out alone upon the hospital grounds.

On the ninth week after admission the notes state that patient was convalescing. There was some mental enfeeblement, but this even was not marked. His weight at this time was 135 pounds. There were distinct nodes over each parietal eminence. One of these, on the left side, remained at the time of his discharge, on the 20th of December, when he went home mentally apparently well, but to remain under observation. He had no recollection of his admission to the hospital.

He has once visited the hospital since his discharge, to report his condition and to state he had resumed business.

Observations.—The two cases reported, with such opposite symptoms, go to establish the assertion that has been made that there is no uniformity of brain disease following syphilis, and that the term "syphilitic insanity," while it may be a convenience, may also be misleading. Epilepsy and melancholia, due to syphilis, the close relation that is known to exist between syphilis and paresis, as well as the cachexia resulting from syphilis, show the dissimilar conditions that may arise in some way from defective nutrition or nervous irritation produced by degenerations and growths from this disease. The case of acute mania reported, is probably one of its rare manifestations. I have never met with a similar case in practice, although such cases may have been observed and reported. This case might have escaped recognition had it not been for the clew which the eruption furnished. The last case is not an unusual one, except as to the favorable result that fortunately occurred, but conveys the lesson that the physician is sometimes warranted in increasing the doses of his remedies until he gets the result desired.

[After the reading of the preceding paper:]

Dr. S. Weir Mitchell said: This paper recalls to my mind a number of cases in which a diagnosis of general paralysis of the insane had been made and the case regarded as hopeless. Several of these persons, whose condition was brought about by syphilis, were in such a mental state as to prevent the acquisition of knowledge as to their previous history, or else the relatives accompanying them were ignorant as to it.

I recall one such case which, after a brief examination, I dismissed as being clearly general paralysis of the insane. The patient was totally unable to give any account of himself. He fell afterward into the hands of my friend Dr. Horatio Wood, who suspected that there might have been specific disease of a syphilitic nature, treated him according to these views, and, I believe, happily cured the patient.

Dr. J. William White said: I should be glad to hear something more said about the points that are considered, by neurologists, as diagnostic of syphilitic insanity. I have frequently been confronted by this form of nervous disease in which, there being a strong suspicion that syphilis was the cause, from the fact that the patient presented a clear history of that affection, I have found a certain group of symptoms which I have learned to regard as characteristic. This consists principally of severe headache, melancholia, aphasia, and general failure in nutrition, sometimes associated with somnolence and usually followed by a condition which, finally, is indistinguishable from general paralysis of the insane. The melancholia is a marked symptom and contrasts strongly with the delirium of grandeur so common in non-specific cases. I have lost two cases from suicide in the early stages of the development of this form of trouble.

Dr. Charles K. Mills said: I might make a remark in regard to the question of the therapeutics of syphilis in connec-

tion with these cases from the other side. I have had many experiences, several of which have been of public interest. In these cases the diagnosis of syphilis was very positively made, and it may be correctly made by another physician, not only in private but also in newspapers. These cases have taught me that while it is important to bear in mind the possibility of the syphilitic nature of cases without syphilitic histories, it is undoubtedly true that in a number of cases of insanity with a clear syphilitic history, the disease is not amenable to anti-syphilitic treatment. There are probably certain diagnostic points by which a distinction can be made between syphilitic dementia, which is curable or partly so, and incurable paretic dementia with a syphilitic history. My view is that syphilis not only causes gross lesions of a certain character, but that it may also induce brain changes indirectly by causing sclerosis, end-arteritis, etc., in a strict sense not specific. My experience is, that we can usually decide that a case is one of incurable paretic dementia if certain physical symptoms are present. I have never seen a case cured in which the changes in the iritic reflex were marked, nor in which the knee-jerk was obliterated after having been once present. There may be other physical signs which I do not now recall, which, when present, entirely preclude the idea of recovery. Of course, with these you have the ordinary symptoms of paretic dementia. It seems to me that in the last case reported the symptoms usually found in cases probably curable were present, as the hebetude, the restlessness, and the delusional condition. So far as I can recall, the author did not mention any of the decided physical signs of paretic dementia.

Dr. Frank Woodbury said: The condition known as morbid fear is generally admitted to be an evidence of alienation or a symptom of mental disease. If by syphilitic insanity is meant mental disorder following syphilitic infection and appearing in conseqnence thereof, it would seem that, in addition to the cases which have just been cited, where actual syphilitic disease of the hemispheres or their membranes is present, there

are others where no such lesions can be found. Even in cases of syphilis in the stage of the primary lesion, too early, therefore, to have cerebral syphilis, melancholia may develop and the patient commit suicide, as a result of what has been clinically termed "syphiliphobia." Strictly speaking, these may not be admitted to be cases of syphilitic insanity, but the same objection has been raised against the other cases cited: that the mental disorder in them is the result of pathological changes in the brain, which may or may not be due to syphilis, the mental disorder being symptomatic of the lesion and not of syphilis. Will Dr. Chapin please state what has been his experience with syphiliphobic patients who are not actually suffering with brain lesions?

Dr. Chapin said: With reference to the question raised by Dr. White, I know of no pathognomonic symptoms indicating the existence of mental disease arising from syphilis. I think that we must sometimes infer this from the history of the case and other indications. If the history of syphilis is well made out with the symptoms present, as in the two cases presented, we are warranted in entering upon a vigorous course of treatment.

The question proposed by Dr. Woodbury perhaps does not properly belong to insanity actually resulting from syphilis. There are a number of persons who come to asylums under the apprehension that in some way or other they have contracted syphilis. They become hypochondriacal. They become melancholy. They pass through a period of prolonged depression and sometimes recover, and sometimes do not. The depressing moral influences alone seem to have been operative to bring about the depression. Such cases are simply instances of hypochondriacal melancholia, called, however, syphilophobia to distinguish the nature of the prominent delusions, by a name.

MUCOUS COLITIS.

By

T. HEWSON BRADFORD, M.D.,

PHYSICIAN TO THE HOWARD HOSPITAL.

[Read March 7, 1888.]

The specimen I present this evening and the brief notes accompanying, I have been induced to prepare since having heard the able paper so recently read by Dr. W. A. Edwards, entitled "Membranous Enteritis."

I have, I think, properly termed the case I present, as "Mucous Colitis."

On the evening of January 1st I was hastily summoned to Mrs. S., æt. fifty-eight years, who was much alarmed at the character of the discharge from the bowels. I was shown what passed and found it to consist of a thick, gelatinous material, yellowish-green in color, with slight fecal odor, and a tendency to disintegrate. It was probably about fifteen inches in length and a half inch in diameter and resembled greatly the umbilical cord before ligation. After the passage of the mucus the bowels were freely moved, natural in appearance, and accompanied with no pain or effort as had been the case for some time previously. I must here mention that the patient was under my care at the time, suffering from a severe attack of cystitis which has caused her trouble for several years past, but at the time of the passage of the mucus the disease had yielded to treatment and the patient

was convalescent. Mrs. S. is a woman of strong, firm will, Scotch in descent, with no hysterical tendencies, but of a constipated and dyspeptic habit. There is no uterine displacement so often accompanying both cystitis and constipation.

Before and after the passage of the mucus there was a total absence of diarrhœa, which usually precedes such passages, and there were no colicky pains. I believe this disease more frequently occurs than is noticed, but as its symptoms are not marked, the mucus passes away in small quantities with an attack of painful diarrhœa.

The specimen I handed to my friend, Dr. J. P. Crozer Griffiths, who kindly made the following microscopical examination:

"The material handed me for examination consists of irregularly branching cords, of which the central portion is more consistent and opaque, the periphery softer, mucilaginous, and more transparent. The substance dissolved in potassium hydrate and in cold nitric acid, but became denser in alcohol and acetic acid. Under the microscope is revealed a finely striated, fibrillated material with few cellular elements and having all the appearances of mucus. Epithelial cells are but scanty. Fat globules and other fecal matters are attached to the cords."

[After the reading of the preceding paper:]

Dr. J. L. Ludlow said: A case of this same disease occurred in a middle-aged lady, very nervous, about one year ago. She was taken sick while in the State of New York, and was treated for catarrh of the stomach. She was then brought to Philadelphia. The stools passed contained casts similar to those exhibited this evening. I found no involvement of the stomach. In the treatment of her case, I used what I have found efficient in the case of young children in whom a similar condition has occurred. This is a mixture of turpentine and chlorate of potassium rendered pleasant to the taste. This lady entirely recovered.

CASE

OF

SUCCESSFUL SIMULTANEOUS TRIPLE AMPUTATION FOR RAILWAY INJURY, WITH REMARKS ON THE TECHNIQUE OF MULTIPLE AMPUTATION.

By

JOHN ASHHURST, Jr., M.D.

[Stenographic report of a verbal communication made March 7, 1888.]

This patient is brought before the College largely on account of the rareness of simultaneous triple major amputations. It is quite possible that some of the Fellows may not have had an opportunity of seeing such a case.

The patient is a Moor, twenty years of age. He was admitted to the University Hospital, November 28, 1887, having been run over on the Pennsylvania Railroad. I saw him within two hours after his admission. I found a compound comminuted fracture of the right leg, the laceration extending above the knee; complete avulsion of the left leg, the limb having been torn off in its lower third; and a compound fracture of a severe character of the right hand and wrist. There was also a compound fracture of the skull, involving the frontal bone. This, however, was an impacted fracture, of

course without much depression, and did not require interference. In addition to these injuries, there were numerous brush-burns and contusions, some of a grave character. One upon the left buttock was so severe that the separation of the slough left a cavity fully two inches in depth. Notwithstanding these serious injuries, the patient's general condition was very good; he had reacted thoroughly, and his axillary temperature was 99° F. Under these circumstances, I felt justified in proceeding to the immediate removal of the injured limbs, and amputated successively the right thigh by the antero-posterior flap method; the left leg, about its middle, by a modified Sédillot's external flap operation, the modification consisting in making both flaps from without inward, instead of cutting the external flap by transfixion; and the right forearm by an oval incision, making use of the uninjured skin of the back of the hand and wrist. Certain variations from the ordinary procedure in amputations I shall refer to when I come to speak of what I have ventured to term the technique of multiple amputations. After the operations were completed, the temperature had fallen only to 98° F. The patient had no bad symptom and rapidly recovered, and as you see him now all his wounds are perfectly healed, and he is entirely well.

I have collected some statistics of synchronous multiple amputations. I am able to find but one instance of *quadruple* synchronous amputation—a case in which the operations were done for frost-bite by Dr. George E. Jackson, of Dakota. There are several cases recorded of quadruple amputations, not synchronous, the one which approaches nearest to a synchronous operation being that of Champenois, a French surgeon, who amputated three limbs on one day and the fourth a few days later.

Of synchronous triple amputation there have been reported four successful cases, not including that presented to-night; one by Dr. Köhler, of Schuylkill Haven,

Pa.; one by Dr. Lowman, of Johnstown, Pa.; and two referred to by Professor Agnew, in his *Surgery*, one occurring in the practice of Dr. Stone, of New Orleans, and the other in York, the name of the surgeon not being given. There are reported four or five triple amputations not synchronous. I have myself resorted to synchronous triple amputation in two cases. Several years ago, I had occasion to perform this operation, removing both legs and the right forearm of a man aged forty-five years, of intemperate habits. The patient died on the tenth day, the fatal result being due rather to the visceral lesions resulting from alcoholism than to the operation.

Double amputations are comparatively numerous. I have personally performed fifteen such operations, this number not including two successful cases of double partial amputation of the feet. I have done fifteen double major amputations, of which five have ended in recovery. One of the patients who recovered, I had the honor of exhibiting to the College some years ago; the amputations in his case were through the right hip-joint and through the left leg. In the fatal cases, seven of the deaths occurred within less than one day, and were, therefore, the immediate result of the shock of the injury and of the operation. Three patients died, one in three days, one in four days, and the third in eighteen days. The latter would probably have recovered, but that he also had suppurative disease of the middle ear, which appeared to be the cause of the pyæmia which proved fatal; for when the stumps were examined, after death, they were found to be in good condition.

With regard to what I have termed the technique of multiple amputations, there are some points which my experience justifies me in urging upon surgeons as of

importance in promoting success. In the first place, it is very important that the time occupied by the operations should be brief; that the operations should be done systematically, so as to keep the patient under the anæsthetic as short a time as possible. The next point, perhaps of even more importance, is to keep up the temperature of the patient during the operations. I have been led to think that this is, perhaps, of more importance than anything else. Of course, loss of blood must be scrupulously guarded against, and loss of blood directly causes loss of temperature. In this case, hot cans were kept around the patient during the entire operation; and, in order to save time, I operated systematically, the tourniquet and Esmarch bandage being both employed to prevent any loss of blood. I began with the most serious injury, and this is, I think, a point of importance. It may happen that, after the removal of one limb, it will be found that further operation must be postponed on account of the patient's condition, and then it is, of course, better to leave him with the less severe injuries. In this case, I began with the thigh. After amputating the limb, I secured the main vessels, which were readily found. I attempted to tie the arteries with catgut, but as the ligatures broke, I substituted silk, and, in order to save time, left both ends uncut. I next amputated the right leg, securing the vessels in the same manner, and then passed to the forearm. I then came back to the right thigh, screwed up the tourniquet and removed the Esmarch bandage, and secured all the vessels that required ligature, then passing to the other limbs in the same order as before. After the vessels had been secured in each case, a towel dipped in a hot antiseptic solution was placed between

the flaps. The wounds were then dressed in the same order, and in this way the operation was completed in a comparatively short time.

The points which I have mentioned I believe to be of great importance, and I think that much of the disappointment of surgeons from these operations is due to a want of attention to these matters.

I should also say that, in order to preserve the bodily heat, I did not use irrigation during the amputations. I think that this often seriously reduces the temperature; and even in comparatively slight operations where it has been used, I have seen the temperature fall to 97° F., and even 95° F. I think that in any grave case it is better to omit it and to rely upon washing with hot antiseptic solutions before and after the operation. Also, the packing of wet towels around the seat of operation, as is very commonly done, tends to depress the temperature, and in grave cases should be omitted.

I think that it is to an observance of these precautions that I have owed success in this case, and in many other serious operations of various character.

[The patient was then exhibited to the Fellows of the College.]

[After the reading of the preceding remarks:]

Dr. William Hunt said: Dr. Ashhurst has dwelt upon the importance of saving time. There is one way in which time might be saved, and that is, by more than one surgeon operating at the same time. Dr. Morton and I have done that on two occasions, each taking a limb and operating at the same time. I do not know how it would work with three.

Dr. H. C. Wood said: I should like to make a remark with reference to this point of keeping up the animal heat. Many people die in acute disease, in acute poisoning, and after severe operations, because the temperature is not maintained. I have proven by experiment that if two animals are subjected to severe injury, and one is kept in a moderately cool room, and the other in a hot room, the one will die and the other recover. In this connection, I will repeat a suggestion made to me by Dr. Dercum, which would afford one of the most efficient measures for maintaining temperature—and that is, to fill the ordinary water-bed with hot water, and allow the patient to lie on it.

Dr. Carr, of Washington, said: I did not know until I heard the remarks of Dr. Ashhurst the importance of a case that I have had. I have performed a quadruple amputation for frost-bite. The patient was brought into the hospital in a condition of collapse with the four extremities frozen. He reacted well, and remained in the hospital a week, when his constitutional condition became serious, and after consultation it was decided that amputation of the four extremities was desirable. I operated, removing one foot above the ankle, the other foot through the metatarsal joint, one forearm about its middle, and one hand, leaving a small stump of the thumb, disarticulating it at the metacarpo-phalangeal articulation. The patient did very well.

In operating I secured the vessels with hæmostatic forceps, and left the stump in that condition while I proceeded to amputate another limb.

Dr. J. William White said: I understood from Dr. Ashhurst's paper that in his classification of triple amputations partial amputations were not included. I had last year at the University Hospital a double knee-joint amputation, with amputation of a portion of one hand, leaving the thumb and one finger, and should have been glad to present the patient this evening.

In reference to the technique, I have only one or two suggestions to make. If the irrigation is done with warm or hot water, it does not necessarily reduce the temperature, and, in fact, may aid in keeping up the bodily heat. The same is true with reference to the use of wet towels, which can be wrung out of hot water and frequently renewed. Braman, assistant to von Bergmann, has recently detailed the results obtained at the latter's clinic by packing wounds with iodoform gauze. This prevents the formation of a blood-clot, which is, perhaps, next to a failure to secure asepsis, the most important cause of the failure to obtain primary union. Where there is danger of oozing, he packs the wound with iodoform gauze, which is allowed to remain from forty-eight to seventy-two hours. It is then removed and the sutures applied; in the vast majority of cases union by first intention is secured. Even when it was left *in situ* for from four to six days such union occurred after suturing. In a case of double or triple amputation time might be saved by packing the first operative wound with iodoform gauze as soon as the vessels are secured, and then dressing it. This could be done by an assistant, and the patient removed to the ward much sooner than if time were taken to introduce stitches. The suturing could be done any time during the next two or three days.

Dr. S. Weir Mitchell said: I have listened with a great deal of pleasure to the remarks as to the temperature of patients

under ether or chloroform, and the possible influence of irrigation upon these cases.

I would like to ask what some of the gynecological operators would say. In their cases the abdomen is sometimes largely opened, and the intestines exposed; if irrigation lowers the temperature in ordinary surgical cases, how much more should it do so in these?

I think it would be advisable to have a series of experiments and observations as to the effects of ether, chloroform, and perhaps other anæsthetics, upon the temperature, when used for long periods. As concerns the interesting case of triple amputation shown us by Prof. Ashhurst, I would like to say that no physiological statement has been made, so far as I know, as to the effect of large losses of tissue upon the pulse, temperature, nutrition, blood-pressure, amount of urine, etc. A tempting subject here awaits some industrious observer.

Dr. White said: Experiments are now being made at the University of Pennsylvania, upon animals and clinical subjects, to determine the effect of the administration of ether on the bodily temperature, and seem clearly to indicate that a drop of from one to three degrees may be expected, not only in cases where no irrigation was used, but even where no operation of any sort has been performed.

The note of a case has just been handed to me, in which the temperature fell four degrees. The temperature before operation was 99.5°, and after operation (which was the removal of a tubercular testicle) it was 95.5°. No irrigation was employed. No general symptoms of shock, such as weakness or failure of the pulse, leakage of the skin, or shallowness of respiration, were observed in this case. A series of nine cases of all sorts of operations gave similar results, though the average reduction of temperature was not more than two or three degrees.

Dr. William Goodell said: In removing the ovaries, one has to be very cautious on account of the collapse that may

occur if the ovary is pinched or roughly handled. Something similar, I fancy, would occur in the removal of the testicle, and this, I think, had a good deal to do with the fall of the temperature noted.

Dr. Ashhurst said: The suggestion made by Dr. Hunt is an old one. Before the days of anæsthesia it was thought that the patient might suffer less pain by having both operations done at once; but, when the patient is insensible, there will certainly be less confusion by having only one done at a time.

With reference to irrigation, as I have already mentioned, I have seen the temperature fall as low as 97° after a simple operation, and in operations not usually considered capital, such as the removal of the breast, the temperature has gone even lower, and the patient has remained in an extremely critical condition for hours. This has been where there was no loss of blood, and no condition other than the irrigation to account for it. In cases where antiseptic measures have not been employed, I have not seen this depression, except when there has been great loss of blood, or unnecessary exposure of the patient.

In my list I have not included any but synchronous major operations. The cases reported to-night seem to have been instances of minor amputation, as regards some of the parts removed, and can, therefore, technically be looked upon as only double, not triple or quadruple amputations.

Another word with reference to irrigation; even if warm solutions be employed, they will tend to cool the body by evaporation, and the same is true with regard to wet towels; even if hot when applied, they will reduce the temperature unless covered with oiled silk, to prevent evaporation. I do not think that the administration of ether alone has much effect upon the temperature, but under any circumstances we can better dispense with irrigation and wet towels than with anæsthetics.

In regard to the case of excision of the testis which has been mentioned, it may be said that operations on the testicle neces-

sarily require considerable exposure of the lower part of the abdomen. It is also a well-known fact, that division of the cord is often followed by profound shock. This observation has been made by Mr. Erichsen, at University College Hospital, London, and my own experience confirms it. The moment that the cord is divided, the pulse fails decidedly, and there is more shock from removal of the testicle than from any other operation of equal gravity in the whole range of surgery.

I have no objections to the antiseptic method of treatment, and I am in the habit of employing it, but I think that we should not close our eyes to the fact that it may have some disadvantages. I think that the maintenance of the patient's temperature is of more importance than the exclusion of a few microbes. All that can be accomplished by irrigation can be equally accomplished by washing the part before and after the operation, care being taken to keep the patient warm and dry. The ordinary antiseptic dressings were employed in this case after the operations; I consider that their chief advantage is that they permit infrequent dressing of the wound.

THE WALK AND SOME OF ITS PHASES IN DISEASE,

TOGETHER WITH OTHER STUDIES BASED ON THE MUYBRIDGE INVESTIGATION.

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[Read March 7, 1888 ; also embodied in a report "On Animal Locomotion," published by the Univ. of Penna., 1888.]

[Note.—As is well known, Mr. Eadweard Muybridge, in the years 1883 and 1884, conducted an elaborate photographic investigation of the successive phases of animal locomotion, at the University of Pennsylvania. The work was a continuation of that begun by him in California in 1872, and embraced a study of animals and man in the performance of various natural movements. In addition, Mr. Muybridge photographed for the writer various patients illustrating abnormal movements, and thus a number of plates of much clinical interest were secured. The following pages resulted from a study of a few of these.

The Plates indicated by Arabic figures refer to the published work of Mr. Muybridge.]

In the following study the writer has made no attempt to give a systematic description of any of the plates, but only to present the salient features of the more important clinical subjects investigated. Naturally these subjects are of greater interest to neurologists than to others. The normal walk, however, possesses an interest that is general, and the writer believes that the Muybridge method has in this field, as in others, yielded new results.

Thanks are due to Drs. S. Weir Mitchell, William

Pepper, H. C. Wood, Charles K. Mills, and James H. Lloyd for the opportunity of photographing various patients under their care.

The writer desires also to express his obligations to Mr. Muybridge for his great and many courtesies, which necessitated not only encroachment upon his most valuable time, but also the occasional adoption of methods not included in his original enterprise.

Regarding the various trajectories depicted in this monograph, it is of course not claimed that they are *absolutely* accurate, but merely as close an approximation to the truth as the method of research permits.

The Normal Walk.

In order that the various abnormal gaits should be properly understood, a study of the normal walk had first to be made. In this connection it is hardly necessary to refer to the work of the Weber brothers, nor to the earlier results of Marey and Carlet, for they are already the common property of schools and text-books. In more recent years, as is well known, Marey invoked the aid of photography to enable him to confirm and add to his original results obtained by the graphic method. His photographs, however, were confined simply to the analysis of the vertical and forward movements of various points of the body, and they gave no information whatever of the direction or extent of the lateral sway. Marey was well aware of this, and by a most ingenious application of the stereoscope to his photographic wheel he endeavored to remedy this defect. The pictures that he obtained are exceedingly interesting, and when examined stereoptically give one the im-

pression of an undulating white band extending through space, the undulations being in three directions, forward, vertically, and laterally. His achievement was indeed a brilliant one, and yet the pictures do not admit of a detailed study of the curves.

However, the method invented by Muybridge, of making simultaneous serial photographs of a moving man or animal from two points of view at right angles with one another, has yielded pictures furnishing all of the elements necessary to determine the various paths of motion. It must, however, be admitted that while by this method the lateral sway is quite definitely ascertained, there is a slight loss in the accuracy of the curve of the vertical and forward movements, and this arises from several causes. In the first place, a possible and probable source of error is slight irregularity in the intervals of time between the successive photographs of a series. No one would pretend that the same accuracy as regards regularity in the sequence of exposures could obtain in a serial battery of cameras as in such an apparatus as used by Marey, in which the sequence of exposures was determined by the fenestra of a revolving wheel. Notwithstanding, repeated chronographic measurements made by Muybridge showed the irregularities of these intervals to be exceedingly small even for very rapid movements. Therefore in a movement relatively so slow as the walk they can be practically discarded.

Another cause for slight loss of accuracy arises from the fact that the person walking cannot be in exact apposition with the lateral background which is used as a scale. This error is of course lessened by the use of lenses of long focus,—*i. e.*, in the lateral battery of cameras, which was placed upward of fifty feet from the

track. Being by this means so much diminished, it can also be discarded. A third source of inaccuracy is due to the fact that the various phases of any movement photographed cannot be, except by improbable accident, directly in front of the centre of each corresponding camera. Therefore each individual phase, instead of being photographed from a position exactly at right angles to the background, is doubtless in the majority of instances photographed at an angle varying slightly from the right angle. Furthermore, for the various phases, this angle is a variable and indeterminate quantity. However, it must again be insisted that for the majority of movements, especially slow movements, such as walking, this error is also small, though it is obviously greater than the second error just mentioned.

Taken all in all, while the serial method gives slightly less accurate results regarding the rise and fall and onward movement of a limb, it more than compensates for this loss—which in itself is slight—by enabling us to determine the amount and direction of the lateral sway. Furthermore, apart from the mere determination of trajectories, two photographs of any one phase of movement taken at right angles give us an opportunity for the study of the action of a part which a wheel-photograph can in no way furnish.

Having considered the various sources of error, let us take up the study of the walk in Plate I. The model was a young man of medium height and was photographed while taking a long step.

By means of a transparent scale identical with that of the background, the vertical and forward movements of various points of the body were readily studied. The lateral sway was determined by means of a transparent

scale based upon the broad divisions of the background at the end of the track,—that is, the distance between the heavy white lines, which is equivalent to thirty centimetres, was taken as the basis of the scale; but for greater accuracy this distance was divided into ten parts instead of into six, as in the original background. A plan of the track was then made (see Plate I.) and the scale corrected for the error in perspective for the area in which the step was taken. In Plate II., the actual size of the track and the normal scale are in red lines, while the corrected scale is in black lines.[1]

It should have been stated that the study of the lateral sway was made upon the middle series of Plate I., as here the images and background are comparatively sharp.

In Plate III. the line *a* represents the rise and fall and onward movement of the white button in the cap worn by the subject, while the line *b* represents the amount and direction of its lateral sway. As in the trajectory of the pubis determined by Marey, the number of vertical oscillations appear to be double those which take place in a horizontal direction.

The rise and fall of the right superior spinous process of the ilium is represented in the line *c*. It is similar in general course to the line *a*, but the amplitude of the wave is much greater. This increase in amplitude is doubtless in part due to the meagre lateral oscillation of the ilium during the time the right foot is fixed upon the ground. In fact, in the line *d* the amount of curve is exceedingly small,—*i. e.*, during the time the ilium is describing the arc *xy* (line *c*).

[1] See explanation of Diagrams.

In Plate IV. the line *e* represents the rise and fall and forward movement of the left foot, the internal malleolus being taken as a definite point. It is seen at a glance that this curve is made up of a number of elements. The curve begins by the malleolus sweeping upward on an arc the radius of which centres in the ball of the great toe. At the next instant the centre of rotation is transferred to the *tip* of the great toe. The balance of the curve up to its highest point is the result of the flexion of the leg and of the forward movement of the pelvis; thence to the final impact of the heel upon the ground the curve is the resultant of a complex movement, in which three principal elements are distinguishable: first, a *pendulum movement;* second, a *fall;* and third, a *forward movement*, the latter being due to the movement forward of the body as a whole. The first two elements are those of a cycloid, and the foot therefore falls to the ground, other things equal, *along the line of swiftest descent.*

A fourth element is observed in the slight secondary rise occurring in the curve just previous to its termination. The significance of this rise is as follows. We notice that the heel of the passive leg in swinging forward in its cycloid-like descent does not immediately strike the ground, but that just previous to the impact it again makes a slight ascent. This is shown not only in the curve, but also in all the plates illustrating the normal walk. (Plate IV.) We should observe at the same time that the rate of motion is not by any means uniform. It is relatively slow in the beginning, but steadily increases in velocity until the step is almost completed, when a slowing of movement again takes place. This slowing of movement is coincident with

the secondary rise. The impact of the heel upon the ground is then made without any waste of force and with a minimum amount of jar. When, in addition, we reflect that the heel is but a portion of a moving lever and that the muscles attached to this lever are elastic, we realize that the jar of impact is indeed reduced to a minimum.

It is further of interest to note that the weight is rapidly transferred to the outer edge of the foot and thence again to the ball of the great toe preparatory to the next propulsive effort. A complex rotatory movement of the foot therefore takes place.

The curves of the lateral sway are also exceedingly interesting. The fact that the lateral sway of the head is greater than that of the hip is exactly in keeping with what we should expect on *a priori* grounds. The pelvis is relatively fixed and not nearly so free to move as the head or upper portions of the trunk; and, secondly, the tilting of a column is naturally exaggerated at its upper and free end.

The lateral sway of the foot again presents an interesting interpretation. Its extent is less than most of us would have expected to find, being in fact very small. This signifies undoubtedly that the extent of the lateral sway is, other things equal, always the least possible consistent with the working of the limb; because, first, the greater the lateral sway the greater the loss of time consumed in again bringing the foot to the ground; and, secondly, the greater the lateral sway of the foot the greater the lateral sway of the body as a whole, and the greater the loss of time and force at the expense of the forward movement.

Finally, taking all of the trajectories together, it is

evident that the movements in the three directions, forward, vertically, and laterally, are correlated. Secondly, the prime object of the walk being movement in a forward direction, it follows, other things equal, that the greatest economy of time and force obtains when the vertical and lateral movements are reduced to a minimum. This is apparently the case in the normal walk.

The Gait in Locomotor Ataxia.

This gait was studied in Plates 546, 549, 550, 554, and 560. All of the cases photographed were typical of locomotor ataxia. The patient upon whom the trajectories were studied is the one of Plate 560. His history is briefly as follows:

H. R., aged thirty-four, a clerk by occupation, first noticed that his general health was failing in the fall of 1883. He was at first treated for general neurasthenia, but soon developed sciatic pains and gastric crises. These last were very severe. He then disappeared from observation for two years. When he again returned he was markedly ataxic, both in the arms and legs. He had paræsthesia of the soles of the feet, contracted pupils, loss of the patellar reflex, retardation of sensation, etc.

In Plate V., 1, is represented the right foot from the time of leaving to again striking the ground. It needs but a superficial glance to show that it differs markedly from the normal foot in its course. Compare, for instance, Plate IV., *g*, *h*, *i*. It differs more widely still from the foot seen in Fig. 9, that of lateral sclerosis.

The direction and extent of the lateral sway were determined by means of a transparent scale corrected for perspective for each position of the foot. (See Plate V.,

2–11.) The external malleolus is selected as a relatively fixed point. The curve evolved is represented in line *a*, Plate V., whilst the rise and fall and onward movement are shown in line *b*, Plate V.

The striking difference between line *a* and the corresponding curve of the normal gait consists in its irregular and extensive outward sway, while in the line *b* the difference consists in the increased amplitude of the curve and in the irregularity of the downward fall. Line *b* is made up of the same elements as the corresponding line of the normal gait; namely, first, a short curve depending upon the upward rotation of the malleolus upon a radius centering in the ball of the great toe; secondly, a more ascending curve depending upon the centre of rotation being transferred to the tip of the great toe. This curve passes insensibly into another, caused by the flexion of the leg upon the thigh and by the onward movement of the hip. It is to be noticed that flexion of the leg is much more marked than in the normal condition; consequently, the corresponding portion of the curve is higher. The fall of the foot to the ground we noticed, both in line *b*, Plate V., and in Plate V., 1, is somewhat irregular; also, that the heel fails to make the slight ascent which occurs in the normal walk just before the impact on the ground; and, finally, that when the impact does take place it is made by a sudden descent or fall.

The writer does not by any means desire to impress the reader as though these curves (*i. e.*, Plate V., *a*, *b*) indicate the invariable paths through which every ataxic must move his feet. He does, however, insist that the two principal factors indicated—namely, the increased lateral sway and the increased height to which

the foot is raised—are constant. To these must be added irregularity of movement, as irregularity is itself an essential feature of ataxia. An interesting confirmation of the constancy of these factors is seen in Plate 550. Here, a Dane, aged fifty-two years, with a history of a long-standing and increasing ataxia, was first photographed (see upper series) while walking with the eyes open. An examination of the figures shows that although the gait differs from the normal in the two principal factors described, yet, owing to the guidance afforded by his eyes and to the evident effort he is making, as shown in the throwing back of the shoulders and the fixation of the trunk, his walk is tolerably good. In the lower series, however, he was photographed *while his eyes were closed.* A remarkable change is at once observed, and it needs no elaborate study of the trajectories to show what the chief elements of the change are. It is seen at once that the foot is raised much higher from the ground, and that the lateral sway is enormously increased; also, that the successive steps are more irregular. In this series, also, the abrupt descent of the foot upon the ground is again noticed, the entire sole impinging or flopping, as it were, upon the ground at once. In Plates 546 and 554, which represent cases of ataxia more or less advanced, the essential points of the ataxic gait are pronounced, as they are also in Plate 549.

To show how difficult it is to observe a moving limb, even when the movement is slow, it need only be stated that medical writers almost without exception describe this gait erroneously. Almost all lay stress upon rigidity of the leg and insufficient action of the knee-joint. It needs but a hasty examination of the photographs to

show how utterly wrong this view is. Every one of the plates reveals the action of the knee-joint, and in fact of all of the joints, to be far in excess of the normal; and, further, the rigidity is *simulated* and not real. Doubtless this erroneous view has its origin in the difficulty of separating mentally the active from the passive phase of the leg. Plate 550, which is one of the most instructive in the collection, admirably suits the purpose of an explanation. It is seen in studying the upper lateral series that the passive leg—*i. e.*, the one suspended in the air—presents exaggerated knee-joint action and that it at no time gives even the semblance of rigidity. The moment, however, that it impinges on the ground—*i. e.*, the moment it becomes active—all action at the knee ceases. More than this, as the weight of the body is brought upon it the extension becomes absolute, and finally the knee is, so to speak, *locked;* that is, slightly retroflexed. (This is well seen in the sixth figure of the series.) By means of this expedient the strain is thrown upon the ligaments of the joint rather than trusted to the treacherous muscles. The rigidity is, therefore, not muscular, which, in fact, all of our knowledge of ataxia forbids. How much voluntary effort on the part of the muscles assists in steadying the limb, of course depends upon the degree to which the disease has progressed.

Regarding the action of the foot and the manner of its impact on the ground various accounts have been given, some writers maintaining that the heel strikes the ground first and considerably in advance of the plantar surface, and others maintaining that the entire sole strikes the ground at once. An examination of Plate 550 shows that the manner of impact probably depends upon the degree of the ataxia. In the upper

series, in which the patient was photographed while having the guidance afforded by his eyes, the heel impinges distinctly before the sole, while in the lower series, in which the patient walked with closed eyes, the entire plantar surface impinged at the same time. Occasionally the toes came down first and sometimes even the heels, so that in advanced ataxia any part of the foot may strike the ground first.

Regarding the lateral sway of the trunk, it needs no detailed study to tell us that it is much exaggerated. In ataxics who are still able to walk comparatively well this exaggerated sway is always toward the side opposite the advancing or passive leg. However, if the ataxia be increased, as, for instance, in the lower series of Plate 550, the sway may be toward the same side, and then the patient is in danger of falling.

The Gait in Lateral Sclerosis.

This gait was studied in Plate 548. The subject was a patient of the University Hospital and was under the care of Dr. William Pepper. His history was as follows:[1]

H. S., aged twenty-eight years, single, is an engineer by occupation, and has been working on a railroad in Wyoming Territory until three or four months ago, when he came to this city. When a child he had diphtheria, which was followed by dropsy and paralysis. Later he was thrown on a hot stove and severely burned, the scar being visible on the epigastrium. When twenty-two years of age he had typhoid fever. He denies having had gonorrhœa or syphilis, although intercourse

[1] See Philadelphia Medical Times, October 31, 1885. Clinical Lecture by Professor Pepper.

with loose women is acknowledged. Careful investigation fails to reveal any trace of specific infection. He has used alcohol in considerable quantities, but has never been intoxicated. He uses tobacco in great excess, smoking as many as fifteen cigars on some days, and chewing a large plug of tobacco every twenty-four hours.

His occupation has been an exposing one, subjecting him to extreme alternations of heat and cold. He, however, continued in good health until three years ago. In December, 1882, he first noticed a gradual loss of power in the left ankle. He states that five months prior to this he had injured the left ankle and knee by falling from his locomotive. This kept him in bed for seven days, then apparently he became entirely well. The feeling of weakness on the left side compelled him to throw most of his weight on the right leg. The trouble gradually grew worse, and in November, 1883, he noticed that occasionally the affected leg would suddenly fly backward when he attempted to move it, and that the muscles of the left side would tremble violently in quick clonic spasm. Unless he moved very carefully this occurred at every step. He next observed that he was losing flesh. His height is six feet one and one-half inches, and his best weight has been one hundred and seventy-nine pounds. Three months ago, when this note was made, he weighed one hundred and sixty-five pounds.

In July, 1884, the affected ankle was sprained, and this was followed by swelling of the foot and leg.

About this time, or a little earlier, he noticed that the fingers of the left hand were disposed to contract, so that the hand would remain closed until the fingers were forcibly extended. The contraction was increased by fatigue. This gradually increased until it involved the hand, forearm, arm, and shoulder.

At the time at which the photograph was taken, the summer of 1885, the patient presented in addition the following symptoms: He habitually carried the left arm (*vide* Plate 548) in the semi-flexed position assumed by

patients having lateral sclerosis or secondary degeneration of the lateral columns. The left leg was decidedly stiff. When sitting on a chair it was extended. The knee-jerk was markedly exaggerated. The gait was "spastic." The right leg also was somewhat affected. It was somewhat resistant to flexion and the knee-jerk was evidently increased.

The gait was studied in detail in the lower series of Plate 548. Plate VI., 1, as well as the lateral series in the plate, shows, in the first place, that the left foot scarcely left the ground, that the heel only was elevated, and that the ball of the foot and the toes were merely raised sufficiently to permit them to slip or scrape along the surface; also that the leg as a whole was very little flexed.

In the other leg the spastic condition, though present, was not so much marked. (See Plate VI., 2.) It is here noticed that the foot is raised clearly off the ground, and that the leg is flexed, and yet neither of these factors is as marked as we find it in the normal condition.

The trajectories were determined, and are represented in Plate VII., *a*, *b*, *c*, *d*.

The amount and direction of the lateral sway of each foot were determined by the use of a transparent scale corrected for perspective for each position of the foot. The external malleolus was the point used in making each measurement. (See Plate VI., Nos. 3 to 14, and Plate VII., Nos. 1 to 12.)

In Plate VII., the upper line, *a*, shows the rise and fall and onward movement of the foot, whilst the lower line, *b*, shows the amount and direction of the lateral sway.

In Plate VII., the lines *c* and *d* represent the same factors of the right foot. It is noticed in the left foot

that the rise and fall as well as the lateral sway are very small. It will be remembered that the left leg was the one most diseased. It was typically affected. In Plate VII., *c*, *d*, the rise and fall are more marked, and this again is in harmony with the fact that the right leg was much less affected than the left. On comparison, however, with the rise and fall of the normal leg (see Plate IV., *i*), these factors are seen to be much less pronounced.

Again, the left foot at the completion of its movement is brought too far within the median line, and thus gets in the way of the right foot. The latter in order to prevent a fall is brought too far outside the median line, and thus the direction of the walk as a whole is changed.

As regards the lateral sway of the trunk, it is of course grossly exaggerated, and always takes place toward the side opposite the advancing leg. It is, in fact, only by means of this grossly exaggerated sway that the leg can be advanced at all; the sway tilts the pelvis and thus assists in raising the limb from the ground.

As regards the relative extent of the lateral movement of the trunk, it is always greater toward the side of the less affected limb.

The gait in lateral sclerosis is so very slow that medical writers have in general given accurate descriptions of it, though the extent of the lateral sway of the foot is too much insisted on. In all probability the lateral sway is never very marked when both legs are affected or affected about equally. It, however, becomes much exaggerated, as we shall see below, when the disease is confined to the lateral column of one side.

Various other Spastic Gaits.

In Plate 553 are presented the photographs of an interesting case, the history of which is briefly as follows:

C. M., aged twenty-four, a laborer, sixteen months ago fell into a pit eight feet deep, striking on the top of his head; he was unconscious for four hours, and experienced upon awakening a severe pain in the back of the neck which increased upon motion. He had absolute paralysis of both legs for six weeks, and of the bladder and rectum for four weeks. The arms, especially in the act of flexion, were markedly paretic. He did not regain the power of walking for nine weeks. He had improved to a certain degree, but failed to progress. At the time of being photographed the pupils were slightly unequal, the right being the larger. No affection of special senses except impairment of hearing in right ear was noted. No anæsthesia existed anywhere. The *legs* were *paretic* and spastic. No specific history could be elicited.

The spastic condition of the legs is well seen in the photographs, though the gait is by no means a typical spastic gait, such as seen in Plate 548 (lateral sclerosis). The feet are raised but little from the ground, and appear to slide along the surface. The lateral sway, though, is greater than in typical disease of the lateral columns. In the latter, the meagre outward movement of the foot is brought about by a forced and extreme swaying of the trunk, and not by the action of the leg itself.

In Plate 543 is found another illustration of an atypical spastic gait. The subject was an hysterical girl.

It is seen by even a cursory examination that the feet, though not raised to the normal height above the ground, are yet raised to a height greater than that seen

in typical lateral sclerosis. The amount of the lateral sway, too, is also relatively large. There is some tendency to scrape the feet along the ground, especially the right one, but there is a decided outward movement.

Other instances of spastic gait are seen in Plates 547 and 552. Both subjects were old hemiplegics with marked secondary contracture. In both instances the paralyzed leg is quite stiff, little or no flexion taking place at the knee. It is also noticed that the foot is here, almost or quite, raised from the ground by the enormous swaying of the trunk toward the sound side, to which additional support is given to receive the sway by means of the crutch. It is significant, therefore, that the crutch be carried on the sound side. In these figures is also seen, precisely as in typical lateral sclerosis, the exaggeration of the normal tendency of bringing the outer edge of the foot to the ground in advance of the sole. This is especially shown in the lower series of Plate 552.

These instances of what might be called unilateral sclerosis differ, therefore, from double lateral sclerosis chiefly in the great exaggeration of the lateral sway.

In Plate 542 still another example of spastic gait is found, but it is not typical. The history of the case in brief is as follows:

J. C., female, aged forty-one, commenced to have pain in the back some fourteen years ago. The pain has steadily continued. Soon after its commencement she noticed some difficulty in walking. The legs "seemed to get stiff and to tremble." Afterward jerking of the hands, arms, shoulders, and head commenced. This jerking, or chorea, is still present, though less marked than before. She has, however, a choreic or spasmodic affection of the muscles of respiration and pho-

nation, as her breathing and her speech are very irregular. Her speech is not infrequently interrupted by a sudden gush of inspiration, which produces an ascending note. She has no chorea of the legs, but her gait is markedly spastic, and she walks with great difficulty. He face, too, is somewhat choreic, and her tongue deviates slightly to the left.

The case was doubtless one of disseminated sclerosis in which the lateral columns were markedly affected.

An examination of the plate shows that she barely, if at all, raises the feet from the ground. The amount of lateral sway, too, is small, and her steps are exceedingly short.

In Plate 541 is seen the walk of an extremely choreic girl,—a chorea which had lasted from early infancy and appeared to be of organic origin It is therefore allied somewhat to the preceding case. At first the gait appears spastic. However, the leg which is at one instant rigid and extended is at the next instant flexed. It is interesting to note the spastic condition of the right arm, which, during the step, is rigidly extended along the side of the body. The head and neck and even the toes are violently contorted. Of course, in such a case no two steps could be alike, and the gait could only be termed irregular.

Other Abnormal Gaits.

In Plate 551 is represented an epileptic suffering from a spastic hemiplegia which is more pronounced in the arm than in the leg, and which dates from early childhood. The gait is in some respects a spastic gait.

Somewhat similar to it is the gait seen in Plate 561,

of a rachitic and hydrocephalic subject. Here both legs are decidedly spastic.

In Plate 559 we have an instance of partial paraplegia. The subject was a druggist in a country town, who had, several years before, been thrown from a horse and had received a severe contusion of the back. He gradually lost power in his legs until almost unable to walk.

It is to be noticed that the feet are thrown forward in a passive or pendulum-like manner, and that the weight is not trusted to a leg until it has been *locked*,—*i. e.*, until the knee has been thrown far backward (retroflexed),—so that collapse from sudden flexion becomes impossible.

In Plate 555 is seen the gait of a case of monoplegia. The monoplegia is due to a commencing muscular atrophy affecting the left thigh and leg. It is seen that the diseased leg is thrown forward (see lower series) in the same helpless or pendulum-like manner as in the case of paraplegia; also (see upper series) that the weight of the body is not thrown upon it until the knee has been well *locked*. This is in marked contrast with the action of the normal limb. (*See plates of normal walk.*)

Again, the strange gait of Plate 558 is worthy of a word. It is that of a case of stuporous melancholia. The patient's history is as follows:

He is twenty-five years old. For thirteen years he worked as a type-finisher, being constantly exposed to fine particles of dust mixed with lead. Three years ago he had an attack of acute lead-poisoning, with marked wrist-drop. A year later he had a period of excitement, with evidences of insanity. He then had hallucinations of sight and hearing, and had

delusions of persecution; thought his sister was trying to poison him, and that his fellow-workmen were constantly endeavoring to have him discharged. After being in this condition for about six weeks, he became sullen and stuporous; he would make no effort for himself; had to be fed and had to have all of his wants attended to by his friends. His stuporous condition largely persists. He does not speak and is apt to remain in positions in which he is placed. His gait might be described as a crouching shuffle. It is certainly in keeping with his mental condition.

Another remarkable gait is that of a case of infantile paralysis, which is depicted in Plate 539, and in which the child has adopted the method of walking on all-fours. The foot-falls, so to speak, occur in the same order of succession as they do in the walk of a quadruped. The case was under the care of Dr. James H. Lloyd, of the University.

Artificially Induced Convulsions.

(Plates 544 and 545.)

In order that these plates may be understood, it will be necessary to quote from the paper[1] in which these convulsions were first described.

Our experiments were performed by subjecting a group of muscles to a constant and precise effort, the attention being at the same time concentrated upon some train of thought. The position we most frequently adopted was the following: The subject being seated, the tips of the fingers of one or both hands were so placed upon the surface of a table as to give merely a delicate sense of contact,—*i. e.*, the fingers were *not*

[1] On the Artificial Induction of Convulsive Seizures, by F. X. Dercum, M.D., and A. J. Parker, M.D. Journal of Nervous and Mental Disease, vol. xi., No. 4, October, 1884.

allowed to rest upon the table, but were maintained by a constant muscular effort *barely in contact* with it. Any other position involving a like effort of constant muscular adjustment was found to be equally efficient. Any one object in the room was now selected and the mind fixed upon it, or some subject of thought was taken up and unswervingly followed.

After the lapse of a variable period of time, extending from a few minutes to an hour, ... tremors commenced in the hands. These tremors became rapidly magnified into rapid movements of great extent, sometimes to and fro, sometimes irregular. If the experiment was now continued, the muscles of the arms, shoulders, back, buttocks, and legs became successively affected, and the subject was frequently thrown violently to the ground in a strong general convulsion.

. . . . . .

Seizures equalling in violence a general convulsion were by no means induced in all subjects, and were generally the result of experiments repeated many times during the same evening.

The subject employed in the experiments from which the photographs were made was a professional artist's model, a woman, aged thirty-five, of indifferent or phlegmatic temperament. The conditions of the experiment were much less favorable, of course, than they would have been in a private room. They were performed in the large open photographic yard and amid the distracting circumstances of strange and unusual preparation. However, as both the plates and figures show, the results were by no means unsatisfactory.

In Plate VIII., 1, the position of the subject and the early stages of an induced convulsion are shown. The figure is the result of a number of tracings of the serial photographs of Plate 545, lower series, being superimposed. The tremor is just being magnified into to-and-fro movements of the hands and feet. A photograph of

this stage was also made by means of a "Marey wheel," and is shown in Plate VIII., 2. The blurring of the hands and feet here show the extent of the convulsion.

In Plate VIII., 3 is the result of superimposed tracings of the upper series of pictures in Plate 545. In this instance the subject was simply seated on a chair facing the cameras. There was no table used. The model had already induced a number of convulsions, and was now asked to induce a convulsion by keeping the fingers in delicate contact with the thighs. In a short time, as shown by the figure, a most violent convulsion was the result.

The individual pictures of this series are especially interesting. The entire pose or attitude assumed by the subject is, so to speak, *hysteroidal*, while the purposeless movements of the limbs suggest those of chorea, than which, however, they are infinitely more rapid.

In Plate VIII., 4, which is the result of a superimposed tracing of the first series of Plate 544, the subject was lying upon a mattress, and the convulsion was induced by simply attempting to keep the hands in delicate contact with the body. The convulsion, as shown by the figure, was of considerable violence.

It might have been possible by prolonging the experiment to produce still more startling results, but the unfavorable surroundings, the temperament of the subject, and the fact of her being much exhausted, forbade, as being both impracticable and unjustifiable, any further attempt.

The reader may appreciate more fully the violence of these seizures when told that of the various figures here given, each represents only a brief portion of a convul-

sion, and that portion embraced within so small an interval of time as 1.8 seconds.[1]

Case of Functional Spasm (Local Chorea). (Plates 556 and 557.)

This remarkable case, some of the phenomena of which resemble those seen in the artificially induced convulsions, was first studied by Dr. S. Weir Mitchell, and reported by him, in the *American Journal of the Medical Sciences* for October, 1876, in a paper entitled "On Functional Spasms." From it we abstract the following history:

R. C.; aged thirty-three; watchcase-maker; married; no syphilis; family history bad; a sister, aunt, and grandmother had palsies in middle life; an uncle had epilepsy, and a cousin dementia. He was always nervous and excitable, used no spirits, smoked moderately, and was always well until the summer of 1865, when he was two days unconscious from sunstroke, and has ever since been made weak by the heat of summer. About two years ago, in the summer of 1874, he observed that while walking the legs felt weak, and he was obliged to stop, as if to regain power; after which the right leg would drag for a time. At the same time he began to have pain in the back of the neck and lumbar spine. These pains continue. In January, 1875, he noticed a slight but increasing tremor in the left arm, and in two or three months the strange condition which I shall try to describe.

When I first saw Mr. C. he was a healthy-looking man, of unusual intelligence, and marvellously patient under his great suffering. In sleep there was no movement; when he awakened he was conscious of the left hand being rigidly closed.

[1] For further particulars concerning these interesting phenomena the reader is referred to the original paper.

In a few moments it began to twitch, the fingers moving as do those of a violin-player. The slightest movement of any other limb, speaking, or eating—even if he be fed—causes the left arm to execute a constant motion of striking the bed or his side, the limb being the while extended. When he arose and walked this action became more violent, and so much resembled the steady, rapid movement of a pendulum that I spoke of it at once to my assistants as a case of what might be called *pendulum spasms.* In fact, its rhythmic regularity was astonishing. Dr. Sinkler timed it, on one occasion, as one hundred and fifty-seven (in a minute); and on several others I found it always exactly one hundred and sixty. It was as accurate as the heart in its motion, but certain things always increased either the power or the number of the motions. Thus, if he stood up, having been seated, the number did not alter, but the force of the blow on the thigh increased remarkably.

If while standing he elevated and extended the right hand and arm to the shoulder level, instantly the rhythm mounted to two hundred; and when the right arm ceased to act the number fell again speedily to one hundred and sixty.

When there was no pendulum spasm he could perform with the left arm any voluntary act not involving the hand, which itself never ceased to twitch; but while the swinging spasms lasted he could execute no volitional act, and the effort to move the limb enormously increased the spasms.

Excitement and emotion, and all forms of electricity, added to the force of the motions, but voluntary movements of other limbs increased the number more than the force. Attempts at passive motion, as the effort to fully extend the partially flexed fingers, cause intense pain in the occiput, just as the effort to overcome rigid gastrocnemii in certain cases gives rise to pain in the dorsal spine. He has the power to stop the spasms by certain manœuvres. If he seizes the left hand with the right and, flexing the left arm, holds it, there is a kind of general spasm; the left hand for a moment seems to struggle with increasing violence; he totters; the face is convulsed; there is horrible pain in the back of the head. Then he gently releases

the left arm, which, save for a slight tremor or twitching of the unquiet fingers, remains at rest, and may not move in violent spasm for an hour or more, and is sometimes nearly still for twelve hours.

He avoids the use of one hand to stop the other, because of the great pain it causes in the head. When he stops the hand with his leg he has little head pain, but it is altogether so unpleasant for him to check it that he rarely does so. When standing, if he wishes to stop the pendulum spasm, he throws the left leg back so as to trip the toe; the arm then falls in as it moves, and he brings the leg forward so as to catch the arm against the thigh, where its own spasm holds it. Then there is a general convulsive movement of the entire body, and the limb is at rest.

When the arm is hanging quiet at his side, it begins to move if he walks a few steps, or if he lifts the right arm, in which at times—especially after sudden arrest of the spasm—I noticed some large tremor.

In all of this strange set of symptoms there is no loss of consciousness, no anæsthesia, no ocular trouble or spasm, no aural defect. When he walks long or fast the legs have some disposition to become rigid, but this is an inconstant feature.

Since this graphic account was published the phenomena presented have undergone some changes. The simple pendulum movement is now replaced by a more complex rotary movement, which is present only under certain conditions. Thus, when Mr. C. is sitting or standing still the arm is carried in a semi-flexed position, while the hand and fingers are markedly contracted and in constant vibration. Were it not for this last factor—namely, vibration—the position would bear some resemblance to that assumed by patients suffering from secondary contracture.

If Mr. C., however, attempts to rise or to walk, the

forearm becomes slightly less flexed, whilst the vibration increases both in amplitude and rapidity. If the walk be persisted in, and be it ever so slow and gentle, the forearm finally becomes completely extended, and now the entire arm describes a rotary motion, such as is depicted in the upper series of Plate 557 and in Plate IX., 1.

It will be observed that this movement is one in which the hand, while it is suspended from the shoulder like a pendulum, describes a circle by first sweeping forward, then outward, then backward, and finally forward again to its original position. Plate IX., 1, illustrates the extent of this movement in the outward direction.

If, now, while the arm is performing this peculiar movement, Mr. C. attempts to raise the arm up to the shoulder, the rotary movement increases wonderfully in extent. (*Vide* Plate 557, middle series.) The arm describes a circle, indicated by the arrows in Plate IX., 2, which, like Plate IX., 1, is the result of superimposed tracings of the individual pictures. The arm extended and the hand and fingers contracted describe a circle in front of the body. The hand sweeps upward and inward, passes the face, sweeps upward and outward, then downward, and then inward again to its original position.

At the same time that this spasm of the left arm is taking place the right arm, too, becomes convulsed. (*Vide* Plate IX., 2.) It is raised abruptly, and the forearm directed upward, and a series of to-and-fro movements commence, which examination shows are *synchronous* with the rotary movement of the opposite limb. As the rotating limb rises the right arm rises; as the former descends the latter descends. As the left arm

sweeps inward and upward the right arm steadily ascends; as the left arm goes outward and downward the right arm steadily descends. There is certainly here a curious association of movement.

If, instead of raising the arm to the shoulder, Mr. C. simply sharply flexes the left forearm at the time it is rotating, as in Plate IX., 3, a series of to-and-fro movements replace the rotary movements (*vide* third series, Plate 557 and Plate IX., 3)—that is, the left arm is thrown violently backward and forward. At the same time the right arm becomes similarly affected, and it, too, is thrown violently backward and forward. As in the previous experiment, the movements are found to be synchronous.

It will be observed that at no time does the right hand become contracted and the fingers "clawed."

Some idea may be gained of the rapidity of these movements when we reflect that the complete cycle of the movement represented in Plate IX., 1, occupied less than 0.47 part of a second, while in Plate IX., 2, the rapidity had so much increased that the cycle occupied only 0.32 of a second.[1]

In Plate 556 further interesting details of this case are illustrated.

If Mr. C. is sitting quietly in a chair with the arm in the semiflexed position already described, and then lies down with his back and head flat upon the ground, all vibration in the hand ceases. It becomes perfectly quiet,

[1] The intervals of time between the positions of the upper series of Plate 557 were 0.048 of a second. The entire movement is included in ten pictures. The duration of exposure for each individual picture was less than 0.004 second. The sum total of the nine intervals and ten exposures is (0.43 + 0.04 = 0.47) equal to 0.47 of a second. In series B, Plate 557, six positions complete the movement.

and he can execute with it the most exact and delicate voluntary movements. If, however, he now attempts to raise the head, violent tremor at once appears in the hand. (See Plate X., 1.) This tremor is so violent that the feet and head are affected. It is remarkable that raising of the head is the only movement that provokes the tremor. Raising the right hand or either foot has no effect.

Similarly, if Mr. C. lie upon the ground and the motion be completely arrested, it is again violently excited by striking the patellar tendon (see Plate X., 2, and series second of Plate 556) or by attempting to elicit ankle clonus.

It is also a remarkable fact that the tremor so excited, or excited by raising the head, cannot be quieted *unless Mr. C. arises completely from the ground and lies down anew.*

It is not within the province of this monograph to speculate upon this interesting case. However, a point that is of exceedingly great interest is the diffusion of the convulsive movement to other parts of the body, notably to the other arm. This fact is exceedingly suggestive with regard to the spreading of the tremor or clonic spasm in the artificially induced convulsions. It seems as though at times the opposite arm was obliged to take up an *overflow of nerve-force.*

It should be stated that Mr. C. is still able to arrest the movement of the left arm, at least in part, by seizing it by the right hand, very much in the manner described by Dr. Mitchell.

EXPLANATION OF PLATES.

In the following explanation the words "lateral scale" are used to designate the divisions of the background opposite the lateral battery of cameras. The words "terminal scale" are used to designate the divisions of the background at the end of the track.

It should also be noted that in making the study of the lateral sway, the transparent scale was for convenience so applied that one of its heavy lines coincided with the central line of the terminal scale. This line is in the centre of the broad division occupying the middle of the background. The line *AB* of Plates I. and II. is, therefore, a projection of this line along the course of the track, and the divisions and subdivisions of the scale are projected in relation with this central line.

PLATE I.

The line *AB* equals the length of the track. The divisions of the line *CD* equal the divisions of the terminal background, equivalent to thirty centimetres each. *B* equals the position of the upright battery of cameras by means of which the middle series of pictures of Plate 1 of Muybridge's photographs were made. *EFGH* equals the portion of the track on which the movement photographed was made The arrow indicates the direction in which the model moved.

PLATE II.

The portion of the track marked *EFGH* in Plate I. is in Plate II. represented much enlarged. The horizontal red lines are noticed to be of two kinds, heavy and light. Of these the heavy lines represent the broad divisions of the terminal scale projected along the track. They are thirty centimetres apart. In the original scale this space is subdivided into six others of five centimetres each. In the plate, however, for greater accuracy it is subdivided into ten parts of three centimetres each, as also in the transparent scale used in making the actual study on the photographs.

The vertical lines in the plate represent the vertical divisions of the lateral scale projected across the track. They are, therefore, five centimetres apart.

The black and slightly converging lines constitute the corrected scale upon which the measurements made on the photographs are registered and on which the curves are constructed. The method by means of which this scale is determined is illustrated in Plate I.

DIAGRAM I.

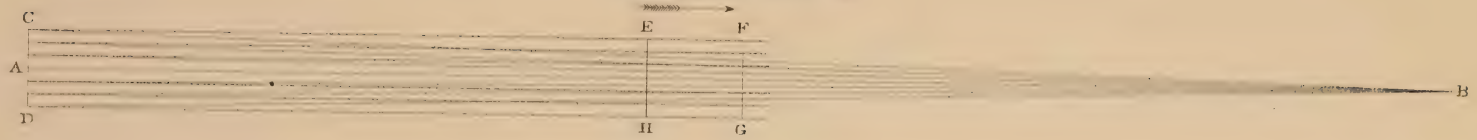


DIAGRAM 2.

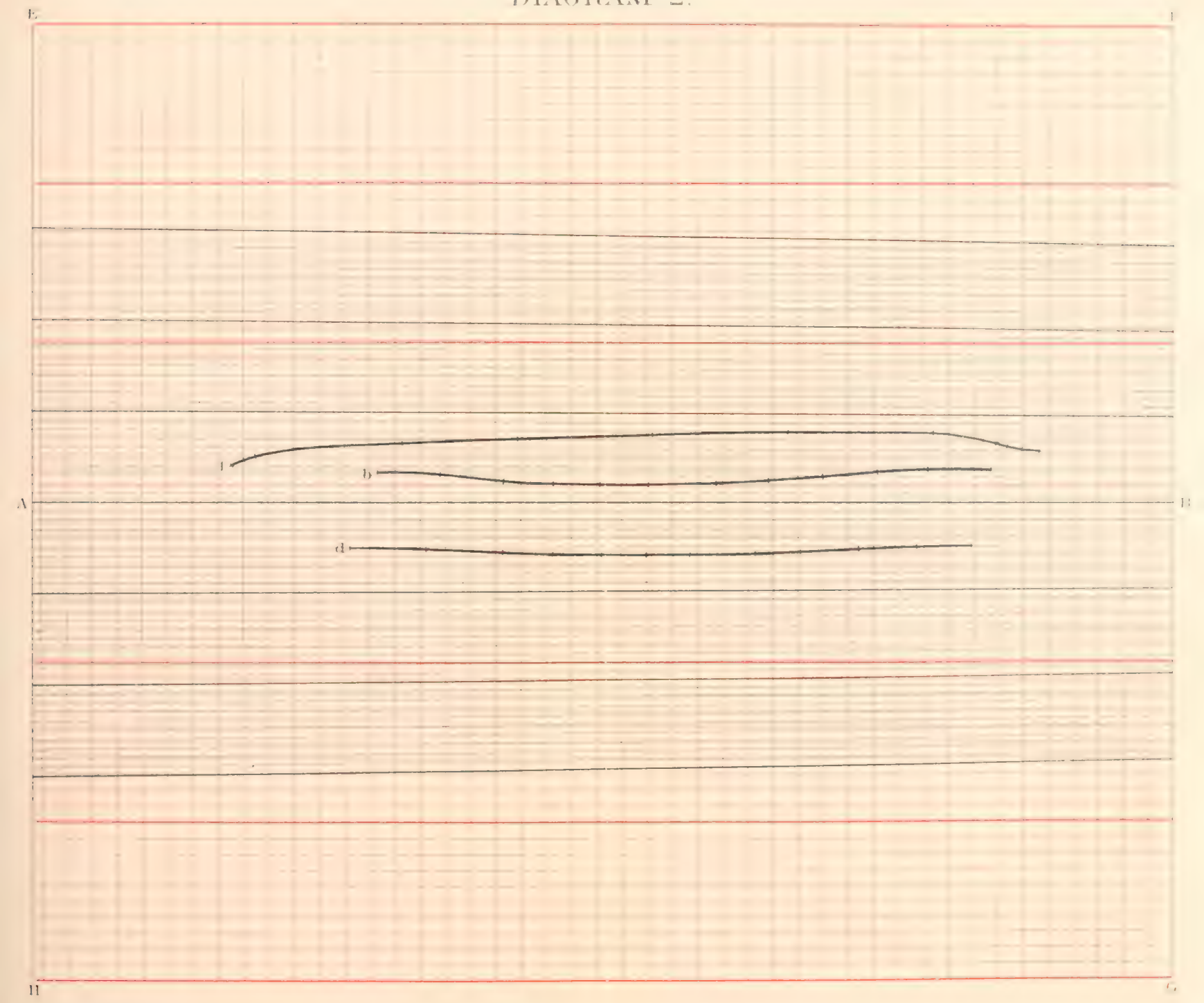


PLATE III.

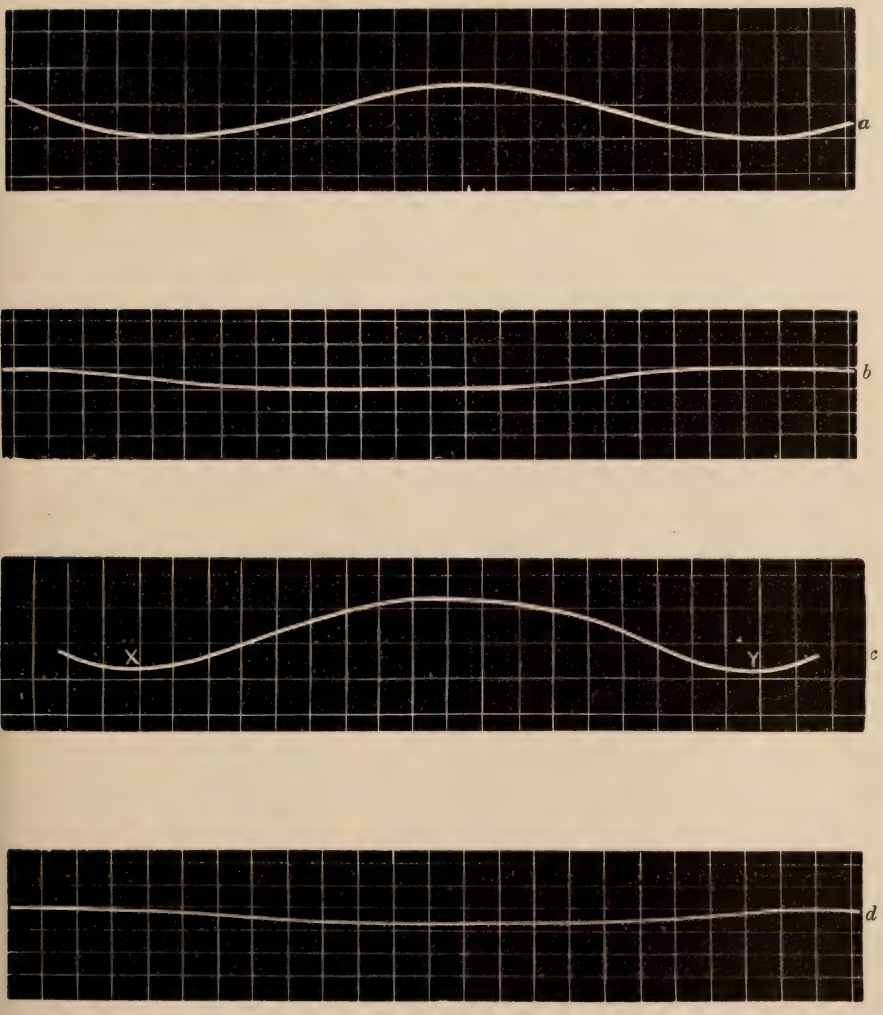


PLATE IV.

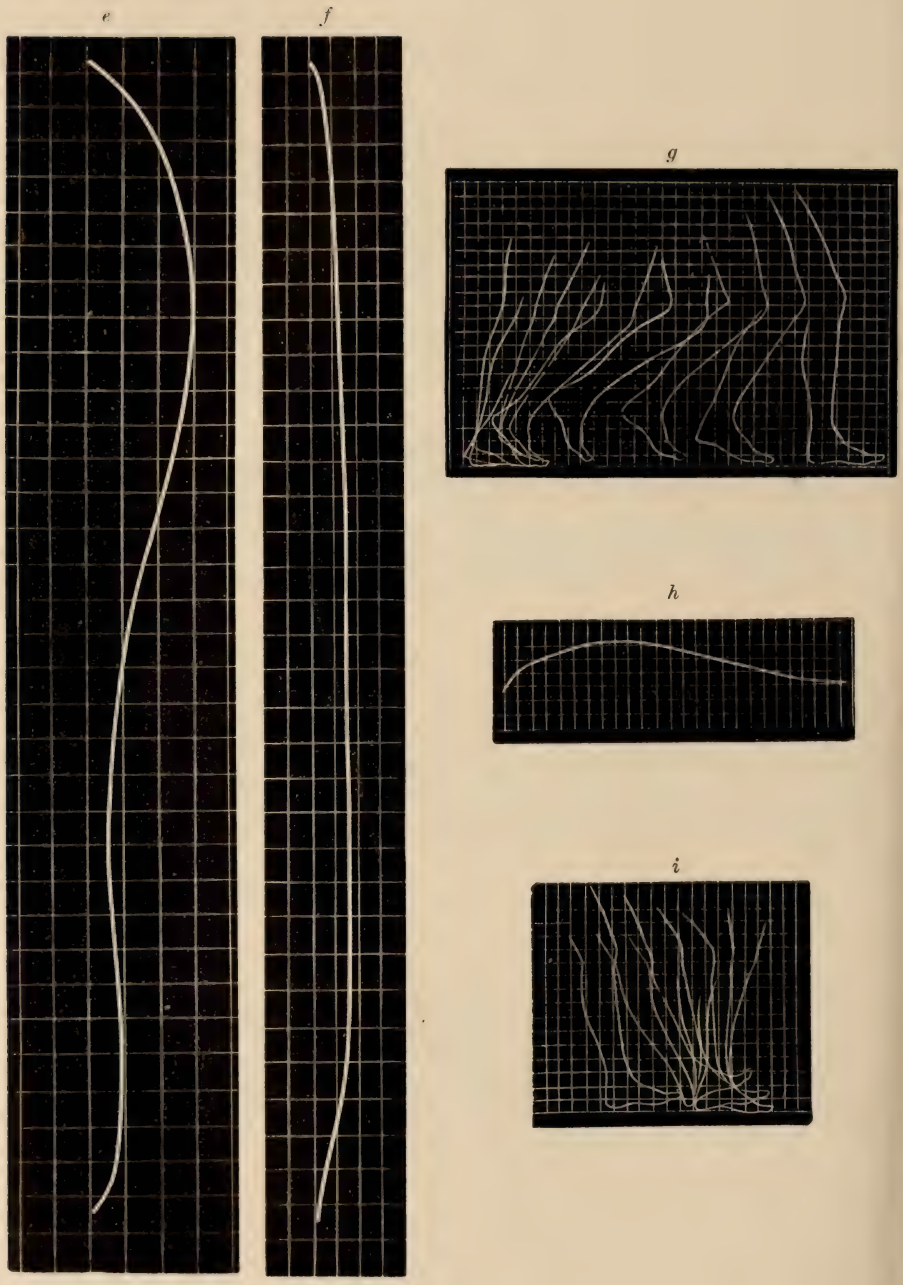
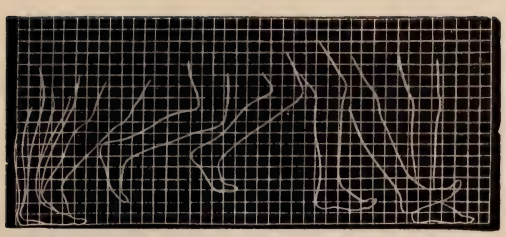


PLATE V.

1



2

3

4

5

6

7

8

9

10

11

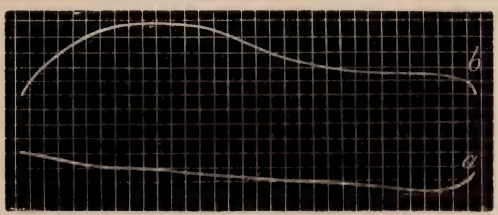


PLATE VI.

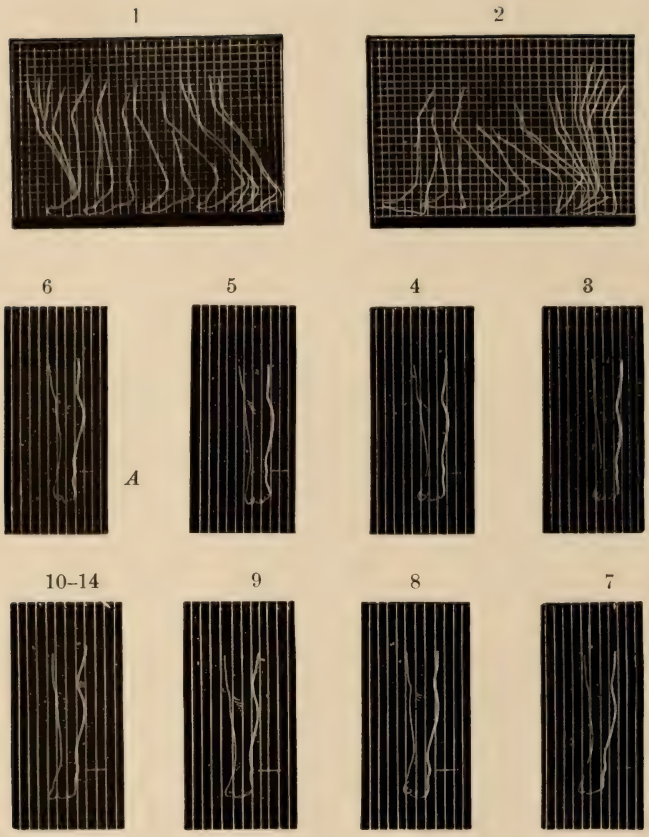


PLATE VII.

1–7

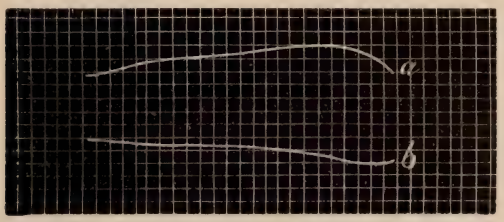
8

9

10

11

12



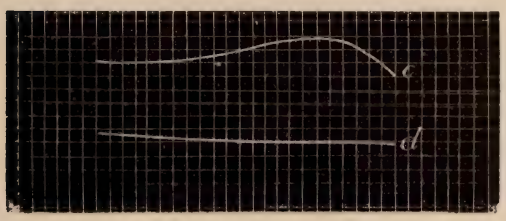


PLATE VIII.

1

2

3

4

PLATE IX.

1

2

3

PLATE X.

1

2

The heavy black line marked *f* is intended to show the extent and direction of the lateral sway of the left foot. The lines *b* and *d* are intended to show the same elements for definite points on the head and hip respectively.

It is evident that the direction of the step was not exactly the same as that of the track, but that it was slightly oblique.

PLATE III.

a. Rise and fall and onward movement of head. The direction of the movement is from left to right.

b. Lateral sway of head.

c. Rise and fall and forward movement of right hip.

d. Lateral sway of hip.

PLATE IV.

e. Rise and fall of the left foot. The trajectory is supposed to pass through the external malleolus. Direction as before, the end nearest *e* being the starting-point.

f. Lateral sway.

g, *h*. Tracing and trajectory constructed from Plate 8, Muybridge. (Incomplete.)

i. Left foot, Plate 8, Muybridge.

PLATE V.

1. Locomotor ataxia, right foot.

2–11. Right foot. The scales are corrected for perspective for each position of the foot.

a, *b*. Trajectories, right foot. They are supposed to pass through the external malleolus. Direction left to right.

PLATE VI.

1. Lateral sclerosis, left foot.

2. Lateral sclerosis, right foot.

3–14. Left foot. The scale is in each instance corrected for perspective. From 9 to 14 there is absolutely no lateral sway, as the foot is fixed firmly on the ground. The curved line represents the external outline of the leg and foot. The point *A*, No. 3, shows the position of the malleus.

PLATE VII.

1–12. Right foot. As in Plate VI., 2, each scale is corrected for perspective. From 1 to 7 there is no variation, and from 8 to 12 the variation is comparatively small. The external malleolus was, as before, the point on which the study of the trajectory was based.

The line *a* represents the rise and fall and *b* the lateral sway of the left foot. *c* and *d* represent the same elements for the right foot. Direction from right to left.

PLATE VIII.

1. Position of subject and the early stages of an induced convulsion.
2. Photograph of same made by means of a "Marey wheel."
3. Superimposed tracing of the upper series of pictures in Plate 545.
4. Superimposed tracing of the first series of Plate 544, the subject lying upon a mattress.

PLATE IX.

1. Rotary motion of entire arm, as shown in upper series of Plate 557.
2. The arm describing a circle, as indicated by the arrows.
3. A series of to-and-fro movements replace the rotary movements.

PLATE X.

1. Violent tremor of the hand when patient attempts to raise the head.
2. Violent tremor by striking the patellar tendon, or by attempting to elicit ankle clonus.

INVESTIGATIONS RELATING TO THE ETIOLOGY AND PROPHYLAXIS OF YELLOW FEVER.

By

GEORGE M. STERNBERG, M.D.,
MAJOR AND SURGEON U. S. ARMY.

[An address delivered by invitation April 21, 1888.]

GENTLEMEN: You are aware that I have been engaged during the past year in an investigation of the methods of inoculation practised in Brazil and in Mexico, by which it is claimed that protection against yellow fever is afforded. The subject is one of such great interest to the medical profession everywhere, and of such importance with reference to the sanitary interests of that portion of the United States subject to invasion by the disease in question, that Congress provided for an investigation of the methods of inoculation practised in Brazil and in Mexico, in the Act providing for the civil expenses of the Government for the year ending June 30, 1888.

Having been selected by the President to make the investigation referred to, in compliance with my instructions I first proceeded to Brazil for the purpose of investigating the methods of Dr. Domingos Freire, of Rio de Janeiro, and after my return from that country went to Mexico, to make a similar research with reference to

the value of the method of inoculation practised by Dr. Carmona y Valle. My detailed report was submitted to the President about a month ago, and by his permission I am now authorized to make public the conclusions reached. As I am about to go to Havana for the purpose of continuing my researches with reference to the etiology and prophylaxis of yellow fever, I am glad to avail myself of the kind invitation of the College of Physicians of Philadelphia, and to present to you, and to the profession generally, the conclusions which I have reached up to the present date.

These conclusions are given as follows in my report, above referred to:

"Facts relating to the endemic and epidemic prevalence of yellow fever, considered in connection with the present state of knowledge concerning the etiology of other infectious diseases justify the belief that yellow fever is due to a living microörganism, capable of development, under favorable local and meteorological conditions, external to the human body, and of establishing new centres of infection when transported to distant localities.

"Inasmuch as a single attack of yellow fever, however mild, protects, as a rule, from future attacks, there is reason to hope that similar protection would result if a method could be discovered of inducing a mild attack of the disease by inoculation or otherwise.

"The hypothetical yellow fever germ, multiplying external to the human body in unsanitary places in tropical regions where the disease is endemic, or during the summer months in the area of its occasional epidemic prevalence, establishes infected localities, and susceptible persons contract yellow fever by exposure in these infected areas. We infer therefore, *a priori*, that the yellow fever germ invades the system by the respiratory tract, by the alimentary canal, or from the general

surface of the body; and it should be found in the blood and tissues, or in the alimentary canal, or upon the surface.

"Another possibility presents itself, viz., that the germ multiplying in insanitary localities external to the body produces a volatile poison which contaminates the air, and that an attack is induced by the toxic effects of this potent chemical poison. The more or less prolonged period of incubation—two to five days—in numerous cases in which the attack has been developed after removal from the infected locality seems opposed to this latter hypothesis.

"In the light of what is known of the etiology of other infectious diseases, the hypothesis that the germ really finds entrance to the body of the person attacked and multiplies within it, is that which presents itself as most probable, and it hardly seems worth while to consider any other unless this is proved by a complete investigation not to be true. In the latter event we would have to consider the possibility of absorption through the respiratory tract of a volatile toxic agent, or through the skin of a poisonous ptomaine formed upon the surface of the body of a specific microörganism which does not itself penetrate to the interior.

"Naturally the attention of investigators has first been given to a search for the 'germ' in the blood of those attacked, and in the blood and tissues of the victims of the malady.

"*The researches made up to the present time have failed to demonstrate the constant presence of any microörganism in the blood and tissues of those attacked.*

"*My own researches, recorded in the foregoing report, show that no such microörganism as Dr. Domingos Freire, of Brazil, has described in his published works, or as he presented to me in his yellow fever germ at the time of my visit to Brazil, is found, as he asserts, in the blood and tissues of typical cases of yellow fever.*

"*There is no satisfactory evidence that the method of inoculation practised by Dr. Domingos Freire has any prophylactic value.*

"*The claims of Dr. Carmona y Valle, of Mexico, to have discovered the specific cause of yellow fever have, likewise, no scientific*

basis; and he has failed to demonstrate the protective value of his proposed method of prophylaxis.

"It is highly important, in the interests of science and of public health, that further investigations be made by more exact methods, which have been perfected since Drs. Freire and Carmona made their researches, and with which they were evidently not familiar."

The failure thus far to find a specific microörganism in the blood or tissues, makes it desirable that a thorough research should be made with reference to the microorganisms present in the alimentary canal, for it is possible that in yellow fever, as in cholera, the disease is induced by a microörganism which multiplies in this situation. Additional researches are also required before we can say definitely that there is no germ demonstrable in the blood and tissues. Having exhausted our researches by the method of direct examination, and by cultures from blood drawn during life, it is highly desirable that various culture media should be inoculated with material taken, with proper precautions, from the various organs, and at the earliest possible moment after death.[1]

I cannot attempt to give you in detail, at the present time, the evidence upon which the conclusions above stated are based, but it is recorded, *in extenso*, in my Report to the President, and will no doubt be published in due time. I shall, however, take advantage of this occasion to call your attention to some of the principal facts upon which I base the unfavorable opinion ex-

[1] The writer went to Brazil and to Mexico fully prepared to make these experiments, but, unfortunately, was unable to secure any autopsies in either place, and the limit as to the time fixed by his orders made it necessary to return to the United States without having made these important researches.

pressed with reference to the claims of Dr. Domingos Freire, of Brazil, and of Dr. Carmona y Valle, of Mexico. Both of these gentlemen, as you are aware, have laid claim to priority in the discovery of the specific germ of yellow fever, and both have practised inoculations with material supposed to contain their "microbe," having in view the production of a mild attack of the disease, and subsequent immunity as a result of this attack.

Dr. Freire has, however, made the greater number of inoculations, and owing to his numerous publications and very positive assertions, his claims have received the most attention. My conclusion, that these claims are without scientific foundation, may seem to you almost incredible, in view of the extended researches which Dr. Freire has made in a locality where yellow fever is endemic, and of the very favorable statistics which he has published in support of the value of his method of inoculation. But I need scarcely remind you that the astonishing development of our knowledge relating to pathogenic microörganisms, which has occurred during the past decade, has been accompanied by numerous announcements of pseudo-discoveries in this field of research, and that much confusion has resulted from the premature publication of experimental researches made by enthusiastic investigators not familiar with the exactions of modern science, or with the exact methods by which alone security is offered against such pseudo-discoveries.

Dr. Freire insists in all his published works that his *cryptococcus xanthogenicus* is present in great numbers in the blood and tissues of yellow fever patients. In his principal work, *Doctrine Microbienne de la fievre jaune*, published in 1885, he makes the following statement:

"The microbe xanthogenicus is a cosmopolitan; it does not select its domicile in any organ and has no preference for any organic liquid. We have encountered it with the same characters, the same opulence of proliferation, in the brain, in the muscles, in the liver, in the spleen, in the kidneys, in the lungs, in the blood, in the urine, in the bile, in the vomit, and even in the cephalo-rachidian fluid. However, it is necessary to establish a well-drawn distinction as to the blood; the blood of the general circulation shows itself much less charged with the microbes than the blood of the capillaries. Thus, if I could admit any preference on the part of the microbe xanthogenicus I would say that it pleases itself better in the blood of the capillaries, in the blood which bathes immediately the anatomical elements.

. . . . . .

"The occasion seems to us a favorable one in order to call attention to some indispensable precautions when the microbes of yellow fever are to be sought in organic solids and liquids. While it is extremely easy to perceive the presence of the microbes of yellow fever in the urine and the bile, for example, by placing a drop of these liquids upon a glass slide, covering it with a thin glass cover, and examining it with a power of 450 to 740 or 780 diameters, this proceeding cannot be employed when the blood is to be examined. If we proceed in this manner the globules will hide nearly all of the microbes, and the observer will wrongfully conclude that they are very rare in this organic liquid. Not only does the form of the microbe offer a certain resemblance to that of the red corpuscles, but these latter in adhering together envelop 'the microbian cells, and, on the other hand, cast upon the cells a jet of light which makes them disappear from the field of the microscope.'

"But if we dilute a little drop of blood in a pure solution of sulphate of soda and place it under the objective, the microbes become visible and will appear in considerable quantity.

"It is likewise necessary to make a preparation previously for the examination of the cerebral mass and of the muscles.

They should be triturated in a sterilized mortar and mixed afterward with distilled water entirely deprived of organisms, filtered through fine linen which has been passed rapidly through the flame of an alcohol lamp, and afterward a drop of the filtered liquid should be placed upon a glass slide. If we withdraw a little piece of brain or of muscular fibre, even triturated, we will not perceive anything abnormal under the microscope unless it be the anatomical elements more or less deformed by trituration.

"It is not the same for the liver. It suffices to withdraw a bit of this organ and to crush it between two glass slides; upon observing it under the microscope we perceive at once a multitude of microbes. This is because in the muscles the microbes are lodged between the fibrillæ and in the substance which surrounds them; and in the brain they are found in the interior of the nerve cells which must first be destroyed by trituration in order that their parasitic hosts may become visible."

Having made extended researches in Havana in 1879, and during the past year in Brazil and in Mexico, I am able to assert most positively that no such microörganism as Dr. Freire has described is to be found in the blood and tissues of yellow fever patients. I have examined blood from numerous cases, drawn from the finger during life, both in the fresh condition, in preparations stained by various aniline colors, and by culture methods, and I have studied with great care a large number of thin sections of the liver and kidney, stained by the most approved methods, from a considerable number of typical cases of yellow fever, without having encountered the *cryptococcus xanthogenicus*.

As Dr. Freire asserts that this microbe is especially abundant in the capillary vessels, it should be easily

demonstrated in thin sections of the various organs made *secundem artem*.

As a matter of fact, my researches show that, as a rule, no microörganism demonstrable by known methods of staining, is to be found in such sections. But here I must state that in certain cases microörganisms have been found. The one to which the most interest attaches is that described by Babes. This was discovered in 1884, in material sent to Paris from the laboratory of Dr. Lacerda, in Rio de Janeiro. At the time of my visit to Brazil, my friend, Dr. Aranjo Goes, gave me material from nine cases,[1] which had been preserved in Dr. Lacerda's laboratory since the epidemic of 1884, and after my return to Baltimore I examined sections stained by Gram's method, and with Loeffler's alkaline solution of methylene blue, from all of these cases. I quote from my report as follows:

"In two of these cases I find in the capillaries of the liver and of the kidneys an organism which has been described by Babes and by Lacerda, who found it in material collected at the same time, and probably from the very same cases as those in which I now find it. This organism is a short bacillus, which occurs in chains, as seen in Fig. 2, Plate IV.

"In certain places, especially in the kidneys, it is found in the capillaries in great numbers, massed together. In other places it is distributed more sparsely, as seen in the figure."

Careful examination of specimens stained with Loeffler's solution shows that the separate elements in these

[1] In December last, having received a request from Dr. Frank Billings for some yellow fever material, I sent him a fragment of liver and one of kidney from one of these cases. It so happened that it was one in which the Babes organism was present, and Dr. Billings has since published an account of his examination of this material in a paper entitled, "Southern Cattle Plague and Yellow Fever."

little chains vary considerably as to their length, and that the ends are more deeply stained than the centre. This appearance was no doubt observed by Babes, who first described the organism in question, but he has interpreted it differently. He says:

"The filaments appear united and homogeneous, with an amplification of 600 diameters, but with a high power ($\frac{1}{12}$th hom. im., or No. 12 of Verick, which corresponds with the $\frac{1}{18}$th of Zeiss) one can assure himself that these filaments are composed of elliptical grains, almost cylindrical, arranged in pairs, forming little groups, in which they are united by an intermediary pale substance. The filaments are thus composed of diplococci, or, if one wishes, of very short rods, with terminal spores." (Op. cit., p. 522.)

Dr. Lacerda has described the organism referred to as in filaments which branch dichotomously, and believes this branching to be a constant and distinctive characteristic of the parasite which he accepts as the veritable yellow fever microbe. He is without doubt mistaken. The apparent branching of the filaments which he has described and drawn, and which he showed me in some of his preparations at the time of my visit to Rio, is due simply to the accidental juxtaposition of the torula-like chains. He is also mistaken in supposing that this organism is only to be satisfactorily demonstrated by Gram's method of staining. My friend, Dr. Goes, shared this belief at the time of my visit to Rio, but I demonstrated to him the facility with which the organism may be stained with a solution of methylene blue, upon sections which he made for me from material in Dr. Lacerda's laboratory. Since my return to Baltimore I have made numerous sections from the same material (two

cases out of the nine) and find no difficulty in staining the organism present in the tissues with methylene blue or with fuchsin. Dr. Goes also supposed that his failure to find this parasite in all of the tissues which he had preserved since the epidemic of 1884 was due to the fact that the tissues had been kept too long. He thought that it was most easily stained in recent tissues, and anticipated that when he had again an opportunity to make autopsies he would encounter this microörganism in the tissues. I shall await with interest his report of his recent researches.

As already stated, I have not been able to find this microbe of Babes in the tissues of six undoubted cases of yellow fever sent to me from Havana, and examined most carefully within six months of the date of the autopsies. Babes, himself, has renounced the idea that this microörganism bears an etiological relation to the disease under consideration. In the second edition of *Les Bacteries* he says :

"Since these researches we have had the opportunity to examine several series of sections from yellow fever: First, the liver and kidneys of two individuals dead from this malady, collected by Dr. Alvarez, were examined in the Laboratory of Pathological Anatomy of the Faculty of Paris without any bacteria having been found; second, material from three cases of yellow fever which Koch was kind enough to confide to one of us. In these three last cases, notwithstanding the most scrupulous research, and notwithstanding the advice of Koch, it was impossible to find the little chains in the brain, the kidneys, the liver, and the spleen. We must suppose, then, that in yellow fever, as in other infectious maladies, microbes are only found in the parenchymatous organs in certain cases, and not in all. The question whether these microörganisms really

constitute the cause of the malady or simply a complication is consequently not resolved.

"We would remark that in view of the negative results attending Babes's more recent researches, and our own extended study of the tissues from six typical cases occurring in Havana, there is no good reason for supposing that the above-described microörganism bears an etiological relation to yellow fever. On the contrary, it seems probable that its presence in material from a limited number of cases occurring in Rio, is either entirely accidental or is due to a secondary complication, perhaps to some form of septicæmia."

From what has been said, and from Dr. Freire's own account of his method of triturating fresh tissues to demonstrate his cryptococcus, the inference seems unavoidable that in his researches made by this method he has mistaken broken-up blood corpuscles and the granular débris of the tissue elements for microörganisms.

In his culture experiments he has, owing to a defective technique, encountered micrococci of various kinds, and one of these, which he brought back with him from Paris in an agar-agar culture, he presented to me as his yellow fever germ.

I brought a pure culture of this micrococcus with me to Baltimore, and have cultivated it during the past winter in various media. It does not correspond in its morphology or mode of development with the *cryptococcus xanthogenicus*, as described by Dr. Freire in his various published works, and, as stated, is not found in the blood or tissues of yellow fever patients.

In his principal work, published in 1885, Dr. Freire gives the following account of the morphology of his cryptococcus:

"When we follow with care and attention the march of the development which characterizes the germs which produce yellow fever, we acquire the certainty that, commencing to present themselves under the form of little points almost imperceptible, they afterward gradually increase in diameter until they attain considerable dimensions; so that these little beings, which at the outset had the aspect of very little grains of sand, not measuring more than 0.001 millimetre to 0.002 millimetre in diameter, arrive little by little to such a development that they reach the dimensions of 0.005, 0.007, 0.008 millimetre, and sometimes even more in certain conditions. When they have attained the adult age these cells are broken at divers points and discharge their contents, composed of spores already formed, mixed with a viscous substance of a yellow color, composed of a pigment and protoplasmic substance, and of the liquids elaborated by the cells."

Even so recently as last year, in an address delivered before the Dosimetrique Society of Paris, Dr. Freire repeats this account of the mode of development of his cryptococcus. He says:

"Each adult cell is ruptured in one or several points, and allows to escape its contents, composed of germs which are to perpetuate the species, and two pigments, one yellow, destined to infiltrate all the tissues, and to produce the icterus color which has given name to the malady; the other, black, insoluble, and destined to be carried along by the circulatory current, producing either capillary obstructions or blood stasis in the parenchyma of the organs."

Now this mode of multiplication is not known among the bacteria, and does not occur in the micrococcus which Dr. Freire placed in my hands as his yellow fever microbe, which multiplies by binary division, and does not differ in its morphology from a variety of micro-

organisms of the same class, which are extremely common in all parts of the world.

According to Dr. Freire's statement, the agar culture brought by him from Paris came originally from the blood of a patient with yellow fever at the point of death.

Now, as heretofore stated, I have demonstrated by the microscopic examination of numerous specimens that, when proper precautions are taken, no microörganisms are found in blood drawn from the finger of yellow-fever patients, and that no development occurs in culture media inoculated with such blood. I infer, therefore, that the micrococci, etc., found by Dr. Freire in his cultures are due to the accidental introduction of microorganisms from without, and especially from the surface of the finger during the collection of the blood. I may remark here that Dr. Freire's cultures in liquid media, which were made before he went to Paris, and which were placed in my hands for examination, were all impure, and contained several different microörganisms. I suppose that the micrococcus brought back from Paris was isolated while he was there from one of these impure liquid cultures, for I found no evidence that solid culture media had been used in his laboratory in Rio prior to the date of his visit to Paris.

Nor did he use, to any extent at least, the well-known methods of staining bacteria which are recognized by bacteriologists as so essential in the study of these minute microörganisms. This is shown by the following quotation from his address, delivered in Paris, to which reference has already been made. He says:

"We know that in order to color a microbe it is necessary first to kill it, and then to wash the little microscopic cadaver

by means of reagents possessing the power of dissolving all matters foreign to its skeleton. At the outset I applied myself to the study of the yellow fever microbe in a fresh state. I fed it with the best food—*les meilleurs engrais*—for the purpose of surprising the different phases of its evolution from its birth to its death.

"Nevertheless, in fault of other accusations, some authors have reproached me with not having colored my microbe. Alas! what a miserable objection. Is it necessary in order to affirm the existence of a microbe which swarms by millions in the urine, in the bile, in the blood, in the tissues, etc., is it necessary to mass them, to disguise them under a costume of carnival, in order to please certain microscopists? M. Pasteur has never colored his microbes, and nevertheless every one admits the existence of the bacillus of charbon, of the corpuscles of pébrine, of the micrococcus of fowl-cholera, etc.

"Do not think, gentlemen, that I fear the application of coloring processes to the search for the microbe of yellow fever. Far from it. In order to show you that the criticism which I have just made is not due to prejudice, I will say to you that such processes have recently been employed upon the yellow fever microbe with complete success."

A character upon which Dr. Freire insists, even in his address delivered in Paris in April, 1887, is the formation of two kinds of pigment, one yellow and one black. From the first he has affirmed that the black color of the characteristic "black vomit" is not due to the presence of blood changed by the acid secretions of the stomach, as has been generally believed by those physicians who have studied the disease, but that this color is due to a pigment produced by his cryptococcus. Now, I have had the coccus which he gave as his yellow fever germ under cultivation in various media, during a period of several months, and no black pigment has been pro-

duced. On the contrary, the colonies in Esmarch tubes, and stick cultures in gelatine or in agar, all have a milk-white color. In morphology this micrococcus does not differ from some well-known and widely distributed species. It liquefies gelatine quite slowly, grows readily at a temperature of 18–20° C. (64.4°–68° F.), and, as stated, forms no pigment.

The supposition that the microörganisms present in Dr. Freire's blood cultures, and in those of various other observers who have discovered yellow-fever "germs," came from the surface of the body and not from the blood is sustained by recent experimental researches upon the sterilization of the hands, made by Kümmell[1] and by Fürbringer.[2]

These experiments show that it is not an easy matter to destroy all microörganisms upon the surface of the body by means of a disinfecting solution, and that a simple washing with bichloride solution of $\frac{1}{1000}$th does not usually insure sterilization of the hands. Fürbringer, after repeated experiments, recommends the following procedure: 1. Remove all visible dirt from the nails. 2. Scrub the hands with soap and water by means of a brush. 3. Immerse them for one minute in strong alcohol—at least eighty per cent. 4. While still wet immerse them for one minute in a two per cent. solution of mercuric chloride.

Less thorough treatment did not in Fürbringer's experiments absolutely insure sterilization. In the case of patients in hospitals, the difficulty is often increased

[1] Wie soll der Arzt seine Hände Desinficiren? Deutsche med. Wochenschr., 1886, No. 32, p. 555.

[2] Untersuchungen und Vorschriften über Disinfection der Hände des Arztes, etc. Wiesbaden, 1888.

by the fact that their hands are horny and begrimed with dirt which can only be removed by long scrubbing.

With reference to Dr. Freire's experiments upon animals, I can only say that those performed in my presence failed entirely to demonstrate that the micrococcus brought from Paris had any specific pathogenic power, and that I find no satisfactory evidence in the record of similar experiments contained in his various publications that it has ever transmitted yellow fever to rabbits or to guinea-pigs, as claimed.

I shall quote here a single experiment in which a fatal result occurred, and in which, as usual, Dr. Freire ascribed death to yellow fever resulting from the injection, notwithstanding the fact that the material injected (blood) had been subjected to a boiling temperature for some minutes. My own numerous experiments show that all known micrococci are quickly destroyed by a temperature much below the boiling-point of water.[1]

Dr. Freire's account of this remarkable experiment is as follows:

"We must note that the microbe of yellow fever offers a remarkable resistance to heat. The following experiment furnishes a demonstration of this:

"On the 17th of April, 1883, we subjected to ebullition for several minutes a gramme of blood containing the microbes. We injected it afterward into a guinea-pig, which had a temperature before the experiment of 38.5° C. (101.3° F.) in the axillary region. The temperature followed this march the following days:

April 18th	39° C. (102.2° F.)
" 19th	39°

[1] The Thermal Death-point of Pathogenic Microörganisms. Amer. Journ. of the Med. Sci., July, 1887, pp. 146–160.

April 20th	39.1°
" 21st	39°
" 22d	38.7°
" 23d	37.4° C. (99.3° F.)

"The animal died during the night of the 23d. Its autopsy showed the characteristic lesions.

"It is necessary to push the temperature beyond 200° C. in order to destroy the toxic energy of the microbe. As we have seen, its virulence resists simple ebullition. The microscope has shown that notwithstanding the boiling the microorganisms retained their ordinary form and continued to execute all of their movements, a proof of their complete vitality. (Op. cit., p. 217.)

"I may remark here that the micrococcus presented to me by Dr. Freire as his yellow fever germ is killed by exposure for ten minutes to a temperature of 60° C., and that it has no proper movements."

Dr. Freire's Protective Inoculations.—Having demonstrated that Dr. Freire's claim to have discovered the specific cause of yellow fever is without scientific foundation, it may be thought that no further demonstration is required in order to show that his preventive inoculations are without value; for these inoculations are said to have been made with cultures containing the attenuated microbe of yellow fever. These inoculations have, however, been made upon so large a scale, and the statistical results, as presented by Dr. Freire, appear so favorable to this method that it becomes necessary to analyze these statistics; and if, as he claims, they establish the fact that the mortality from yellow fever is very much less among those who have been inoculated by him than among non-inoculated persons exposed in the same way, we shall be obliged to concede the value of

his method, although the rationale of the protective influence may not be apparent. In my detailed report I have reviewed at length Dr. Freire's statistics in the light of the facts developed by my personal researches in the city of Rio do Janeiro, where the inoculations were made. I cannot attempt to bring the evidence before you at the present time, and I have already stated to you my conclusion with reference to the matter. In support of this conclusion I shall, however, quote a few extracts from my report.

In 1884, Dr. Freire inoculated 418 persons whose names, ages, place of residence, and length of residence in Brazil are given in an appendix to his principal work, published in 1885. In regard to the evidence afforded by these inoculations, I have written as follows:

"We remark, first, that in selecting foreigners and preferably those who had recently arrived in Brazil for his first experimental test as to the efficacy of his protective inoculations, Dr. Freire has given evidence of his confidence in the method of prophylaxis proposed and of an honest desire to demonstrate its value, and nothing could be more fair than his full publication of the names and of the essential facts with reference to these persons.

"I must object, however, to his including in his statistics the names of thirty-seven persons residing in Vassouras, a village which is some fifty miles distant from Rio de Janeiro. Even if these persons had occasion to visit Rio during the epidemic season, as stated by Dr. Freire, it is probable that they would remain as short a time as possible, and there is no evidence that they were fairly exposed to the epidemic influence. Moreover, if any of these persons had contracted yellow fever as a result of a visit to Rio their names would not appear in the mortality list of this city, but in that of Vassouras, which is not given. The latter objection applies also to fourteen persons among the vaccinated whose place of residence is Nic-

theroy, a town upon the bay of Rio de Janeiro, which is the capital of the province of the same name; two persons vaccinated at Tijuca, and one on board the bark 'Flive,' two at Pavina, and three at Serraria must also be excluded. This reduces the number of vaccinated persons within the city limits to 355; and, of this number, a certain proportion no doubt left the city soon after being vaccinated, and before any exposure worthy of consideration in a test of this kind had occurred."

Dr. Freire admits that "during the epidemic season a great number of the vaccinated were attacked by the malady," but claims that these attacks were of a mild character; yet he gives us the names of seven vaccinated persons who died from the disease. The list has been added to by some of Dr. Freire's confrères, as will be seen by the following translation of a letter published in one of the newspapers of Rio, and bearing date May 5, 1887. The letter is signed by Dr. Aranjo Goes, at present a member of the Central Board of Health, and a gentleman whose statements are worthy of the fullest confidence:

"My letter to the Imperial Academy of Medicine having been published, it now behooves me to publish the statistics relating to the vaccinations on Morro da Viuva.

"One fact seems to me to be definitely demonstrated—that is, the *worthlessness of Dr. Freire's vaccination*, as is well known to the medical profession of this city.

"A year ago I wrote the following:

"'The want of skill which he displayed in his first experiments, the false conclusions which he has drawn therefrom, and the thoughtless precipitation with which he has hastened to make known incomplete results without accompanying them with a single qualifying remark, vitiate all the methods to which he may hereafter resort to corroborate his statements.' (*Journal do Commercio*, April 20, 1883.)

"The mortality among the persons vaccinated on Morro da Viuva furnishes one more proof that I was right in saying this, as I now proceed to demonstrate.

"There were vaccinated in this district sixty persons.

"Sixteen removed shortly after the commencement of the epidemic, and forty-four remained exposed to its influence. Of these, twenty-two had yellow fever, nine of whom died.

"The following is a list of the vaccinated persons who had the fever, the names of those who died being marked with an asterisk:

"*Antonio de Oliveira.
"Antonio Bento da Silva.
"Albino Francisco Maia.
"Jose da Silva.
"*Joaquin Pereira da Souza.
"Joaquin Gomes de Azevedo.
"Joaquin Ferreira Tolho.
"Jose Seabra dos Santos.
"Jose de Sonza Ferreira.
"Jose Gomes de Azevedo, Junior.
"Jose Farinha.
"Manoel Joaquin Pereira Lopes.
"Manoel Gomes de Azevedo.
"*Manoel Antonio.
"Seraphim Goncalves Raymundo.
"*Manoel Simoes.
"Thome Simoes.
"*Manoel da Silva Alves.
"*Antonia Pereira Neves.
"*Joaquim Martino Pinheiro.
"*Joaquim Antonio dos Santos Cardoso.

"Consequently, of the 44 vaccinated persons who remained in the locality 22—that is, 50 per cent.—had the yellow fever!

"Of the 22 patients, 9 died—that is, 40.9 per cent!

"In the Jurujuba Hospital, which receives scores of patients already dying or in the third stage of the disease, the mortality is only 21 per cent.

"After reviewing all of the evidence obtainable relating to the inoculations practised in 1883 and 1884, I say:

"The evidence above recorded seems to the writer to be convincing as to the complete failure of Dr. Freire's proposed method of prophylaxis as practised in 1883 and in 1884. We cannot, however, leave the question here, inasmuch as a modification of the method was adopted in 1884, and a large number of persons have been since inoculated by this modified method. Dr. Freire says in his report under consideration: 'I have employed in nearly all of the vaccinations the endermic method, and it is only recently that I have injected into twenty persons the same cultures by the hypodermatic method. . . . I shall hereafter give the preference to the last mentioned method, because one is more sure that the liquid employed goes to exercise its preservative influence.'"

In 1885, Dr. Freire resumed his inoculations on a larger scale, but instead of selecting unacclimated strangers, those inoculated were for the most part natives of Brazil or Portuguese who had lived for a number of years in Rio and who had passed through one or more epidemics. A considerable number of negroes were also inoculated and included in the statistical tables. With reference to Dr. Freire's statistics for the year 1885 I quote from my report as follows:

"Dr. Freire has omitted to state one very important fact with reference to the vaccinations practised during the period included in this tabular statement. The date of the vaccinations is not given. Fortunately, I am able to supply this omission from his journal containing the names of the vaccinated, which he kindly placed in my hands during my stay in Rio. I find from this record that the inoculations were practised as follows:

January	392
February	342
March	611
April	139
May	273
June	813
July	481

"Now it is well known that June and July are months during which yellow fever does not prevail in Rio, and that in fact the month of May furnishes, as a rule, but few cases.

"The exposure even in an epidemic year amounts to very little during the months of May, June, and July, and may be considered practically *nil* in a year like 1885, when the whole mortality was only 278 in a city of 400,000 inhabitants. But Dr. Freire has included in his list 1294 persons who were vaccinated during the healthy winter months of June and July, and who presumably had been exposed during the preceding comparatively unhealthy months of January, February, March, and April. If these 1294 individuals were protected from an attack of yellow fever by the inoculation practised in June or July, what protected them from being attacked during the preceding months when yellow fever was prevailing to some extent?

"We remarked with reference to those persons selected for vaccination in 1883 and 1884 that 'in selecting foreigners and preferably those who had recently arrived in Brazil for his first experimental test of the efficacy of his protective inoculations, Dr. Freire has given evidence of his confidence in the method of prophylaxis proposed and of an honest desire to demonstrate its value.'

"In his inoculations practised in 1885 we no longer find any evidence of such selection, and so far as we can judge the vaccinated persons simply represent the average population of the city of Rio. It is well known that this population includes a large number of persons of foreign birth and especially of Portuguese. The whole foreign-born population

probably does not fall below 100,000 persons, but I have not been able to obtain any exact statistics with reference to this point. Dr. Freire vaccinated 2186 natives and 865 foreigners. Let us assume for the present that the 1760 persons vaccinated by him during the months of January, February, March, April, and May, were comparable so far as susceptibility to yellow fever is concerned with 300,000 of the population of Rio. In this estimate we exclude 100,000 of the population on the supposition that this number may have enjoyed immunity as a result of having suffered an attack of the disease; 278 deaths in a population of 300,000 gives less than 1 death per 1000, and there should not have been over 2 deaths among the 1760 persons inoculated by Dr. Freire during the months of yellow fever prevalence.

"Let us look at the matter in another light. Dr. Freire gives the following table showing the length of residence in Brazil of the foreigners inoculated in 1885:

For a few days	26
For a few months	71
From one year to one year and a half	69
Two years	107
Three years	98
Four years	126
Five years	103
On board ship (de passage)	9
More than five years	256
Total	865

"These figures also include the foreigners vaccinated in the healthy months of June and July, and those temporarily in the city (a few days 26, on board ship 9), but they will serve our present purpose, which is to call attention to the fact that 759 of the total number given had been in Brazil (and presumably in Rio) more than a year and a half, and had consequently passed through the preceding epidemic year (1884) without contracting yellow fever. If these persons resisted yellow

fever during an epidemic in which the number of deaths amounted to 1597, how can it be claimed that they are protected by a vaccination made in 1885, when only 237 deaths occurred, scattered about (sporadic) in a city of 400,000 inhabitants? The same argument applies with greater force to the 359 foreigners inoculated who had resided in Brazil for five years and above (five years 103, more than five years 256). Unless the list includes persons who had already suffered an attack of yellow fever, these individuals had passed through the epidemic of 1880 (1623 deaths), as well as that of 1883 and 1884, without contracting the disease, and we can hardly ascribe their immunity in the comparatively healthy year 1885 to Dr. Freire's inoculation."

I pass now to the year 1886, during which Dr. Freire inoculated 2763 Brazilians and 710 foreigners, again including in his statistical tables those vaccinated after the epidemic season had passed. In reviewing these statistics I remark as follows:

"We have quoted this last report of Dr. Freire *in extenso* in order to do him full justice by allowing him to state his own case. We shall now proceed to show that his statistics are fallacious, and that the percentage of mortality among the vaccinated, which he finds to be ten times less than among the non-vaccinated, results from a misuse of the statistical method and from a number of factors which are favorable to Dr. Freire's statistics as he has stated them, but not to a fair test of his method of prophylaxis.

"In the first place, we would call attention to the fact that while during the comparatively healthy year 1885 the immunity among the vaccinated of that year is said to be complete (see report of 1885), the number of deaths during the epidemic year which followed is stated by Dr. Freire himself to have been eight. Taking all of the vaccinated of the two years, and without making any allowance for the considerable number of per-

sons vaccinated who had no doubt left the city before the epidemic of 1886 occurred, Dr. Freire, with a total of 6524 vaccinated, and a total of 8 deaths, makes the proportion one per thousand. This is equivalent at the outset to an addition of 1476 persons to the number vaccinated, who, being imaginary persons and not having been exposed to the epidemic influence, simply aid in rounding up the general percentage of mortality in Dr. Freire's favor to the even figure of one per thousand. This is but one of many factors which go to make up this favorable showing. Reference to Dr. Freire's MS. Journals, which he kindly placed in my hands, shows that of the total number vaccinated during the two years, 4465 were vaccinated prior to the epidemic of 1886, that is to say, before the 1st of January, 1886. How many of these left the city before the outbreak of the epidemic, how many were only temporarily in the city when vaccinated, how many died from other diseases, I cannot say; but it is a significant fact that of the 3051 vaccinated prior to August, 1885, Dr. Freire has only one fatal case to report, while out of 460 persons vaccinated in January and February, 1886, he reports five deaths, a mortality of more than one per cent., which he gives as the general mortality among the non-vaccinated. This is not apparent from Dr. Freire's own statement of the case, but is nevertheless true, as I shall proceed to show. In his report, which we have just given in full, he does not give the date of the vaccination of these individuals, but upon referring to his MS. Journal for 1886 I find that No. 3 of his list, Jose, son of Jose da Costa Vieira, was vaccinated February 12, 1886; No. 4, Paschoal Ruffino, on the 6th of February, 1886; No. 5, Henri Constance, on the 1st of January, 1886; No. 6, Fernando Argenteiro, on the 20th of February, 1886; and No. 7, Antonio Saraiva, on the 12th of February, 1886. The same MS. Record for 1886 shows that during these two months—January and February, 1886—the total number vaccinated by Dr. Freire was 460. That is to say, the mortality among those vaccinated during these two months was more than one per cent. On referring to the mortality lists of the city for the same two

months I find the total number of deaths to have been 369, which, in a total susceptible population of 160,000 (Dr. Freire's estimate), would give a mortality of one in 436."

Time will not permit me to extend any further this analysis of Dr. Freire's statistics, and I must refer you to my complete report for additional details, and for an account of my personal investigations in Rio de Janeiro. Nor can I occupy any further time in an account of the inoculations practised by Dr. Carmona y Valle, of Mexico, and of his alleged discovery of the specific cause of the disease under consideration. A simple perusal of Dr. Carmona's published work is sufficient to convince any competent bacteriologist that, owing to a defective technique and inexperience in bacteriological researches, he has fallen into serious errors of observation and of inference, and that his supposed discovery has no scientific basis.

From what has been said, it will be seen that the question of yellow fever etiology is still unsettled, and that it remains, in fact, just where it was left by the Commission sent to Havana in 1879 by the National Board of Health. The researches made by myself as a member of that Commission showed that in yellow fever there is no microörganism present in the blood of the sick demonstrable by the highest powers of the microscope. This conclusion is supported by my more recent researches by the method of cultivation. Before, however, abandoning all hope of finding a specific "microbe" in the tissues, I desire to make cultures from the various organs, obtained at the earliest possible moment after death. Unfortunately, the opportunity did not offer itself for this important experiment during my visit to Brazil and to

Mexico last year, but I hope to have the desired opportunity in Havana during the present summer, and shall also give special attention to a search for the yellow-fever germ in the alimentary canal, where it may possibly be located, as is the case in cholera. It is true that the clinical history of the disease does not especially point to this location, but in a research of this nature it will not answer to reject any possible hypothesis because of preconceived opinions, and inasmuch as the present state of science justifies a belief in a specific micro-organism as the essential agent in the etiology of this disease, it is imperative that the investigations be continued until success crowns our efforts.

MARY REYNOLDS:

A CASE OF DOUBLE CONSCIOUSNESS.

By

S. WEIR MITCHELL, M.D.

[Read April 4, 1888.]

The following account of a case of double consciousness, so called, I have given with as large preservation as possible of the quaintness of statement existing in some of the original papers from which it has been compiled. My attention was first drawn to it by a MS. found among the papers of my father, the late Prof. John K. Mitchell. To students of psychology, at least, I make no apology for the minuteness and consequent length of my narrative.

The account just alluded to was written by Mr. John V. Reynolds, when a student in the Princeton Theological Seminary, during the winter of 1835–6, and was given to Prof. Archibald Alexander, who was much interested in the case, and from whom in turn it came to Prof. Mitchell.

The same Mr. Reynolds, a nephew of the lady whose history he gave, also prepared an account of the case for the Rev. Dr. William S. Plumer, of Allegheny, who published it in *Harper's Monthly Magazine*, in May, 1860.

Major Andrew Ellicott, an uncle of the lady and professor of mathematics in the United States Military Academy at West Point, first reported the case to the Academy of Sciences at Paris, where it excited interest. He also related it to Dr. S. L. Mitchill, of New York, who printed a very short account of it in the *New York Medical Repository* for 1816, and promised its readers a fuller account from the Rev. Timothy Alden. Dr. Alden's letter never appeared in the *Repository*, but amongst other marvels, is to be found in Sherman Day's *Historical Collections of Pennsylvania*, printed in 1843.

Finally, through the kindness of Rev. Dr. John V. Reynolds and his brother William, who are still living in Meadville, where their aunt spent with them the last twenty-five years of her life, I am able to corroborate facts and from these various sources to supply the following account of these two persons in one body—two distinct lives antipodal from every mental and moral point of view.

Mary Reynolds was born in England in 1793, and, when four years old, with her father and mother and their family left their home in Birmingham to settle in Pennsylvania. Leaving in New York the remainder of the family, the father and son started out into the wilderness and choose a spot on the banks of Oil Creek, in Venango County. The whole surrounding country was an unbroken forest. Twelve miles southward were the few inhabitants of Franklin, while six miles to the north lived Jonathan Titus, the proprietor of the land on which Titusville now stands.

In this remote spot William Reynolds and his young son built a log-cabin, in which the father left the lad while he returned to New York to bring the remainder of the family to their new home. For four months the boy remained alone in

the cabin, rarely seeing the face of a white man, but being frequently visited by Indians. In due time the Reynolds family arrived, and with them the daughter Mary.

Her childhood and youth appear to have been marked by no extraordinary incidents. She is said[1] to have "possessed an excellent capacity, and to have enjoyed fair opportunities to acquire knowledge. Besides the domestic arts and social attainments, she had improved her mind by reading and conversation. Her memory was capacious and well stocked with ideas." Though in no respect brilliant, she was thoughtful, and seems to have been endowed with an uncommonly good physical organization.

Her natural disposition tended to melancholy. Her spirits were low. She never gave herself to mirth, but was sedate and reserved; she had no relish for company, but avoided it; was very fond of reading what few books were to be had. She loved to retire to some secluded place where, free from interruption, she read and meditated upon her Bible, and where she was apt to give herself up to prayer and devotional exercises.

When about eighteen years of age she is said to have become subject to occasional attacks of "fits;" these were certainly hysterical, but of their precise characteristics no account is given. However, on a Sunday in the spring of 1811, she had an attack of unusual severity. It occurred while she was in a secluded place reading and engaged in her devotions. Owing to her protracted absence, her friends became alarmed, and after a long search found her in a state of insensibility and in convulsions. The restoratives applied were not very successful. When she recovered consciousness (probably on this same day) she was found to be both blind and deaf,[2] and continued in this state for five or six weeks. The sense of hearing re-

[1] Major Ellicott's account, New York Repository, 1816.

[2] See William S. Plumer's statement, Harper's Monthly Magazine, May, 1860; also Timothy Alden's letter, loc. cit. No mention is made of this in the Alexander MS.

turned suddenly; that of sight more gradually, but in the end entirely.

About three months after this attack, when she had apparently nearly recovered her usual health, though still somewhat feeble, she was found one morning, long after her habitual time for rising, in a profound sleep from which it was impossible to arouse her. After eighteen or twenty hours of sleeping she awakened, but in a state of unnatural consciousness. Memory had fled. To all intents and purposes she was as a being for the first time ushered into the world. "All of the past that remained to her was the faculty of pronouncing a few words, and this seems to have been as purely instinctive as the wailings of an infant; for at first the words which she uttered were connected with no ideas in her mind." Until she was taught their significance they were unmeaning sounds.

"Her eyes were virtually for the first time opened upon the world. Old things had passed away; all things had become new." Her parents, brothers, sisters, friends, were not recognized or acknowledged as such by her. She had never seen them before,—never known them,—was not aware that such persons had been. Now for the first time she was introduced to their company and acquaintance. To the scenes by which she was surrounded she was a perfect stranger. The house, the fields, the forest, the hills, the vales, the streams,—all were novelties. The beauties of the landscape were all unexplored.

She had not the slightest consciousness that she had ever existed previous to the moment in which she awoke from that mysterious slumber. "In a word, she was an infant, just born, yet born in a state of maturity with a capacity for relishing the rich, sublime, luxuriant wonders of created nature."

The first lesson in her education was to teach her by what ties she was bound to those by whom she was surrounded, and the duties devolving upon her accordingly. This she was very slow to learn, and, "indeed, never did learn, or, at least, never would acknowledge the ties of consanguinity, or scarcely those of friendship. She considered those she had once known as for the most part strangers and enemies, among whom she was,

by some remarkable and unaccountable means, transplanted, though from what region or state of existence was a problem unsolved."

The next lesson was to re-teach her the arts of reading and writing. She was apt enough, and made such rapid progress in both, that *in a few weeks* she had readily re-learned to read and write. In copying her name which her brother had written for her as a first lesson, she took her pen in a very awkward manner and began to copy from right to left in the Hebrew mode, as though she had been transplanted from an Eastern soil.

When we consider the length of time required to teach a child these arts, her almost intuitive readiness appears wonderful.

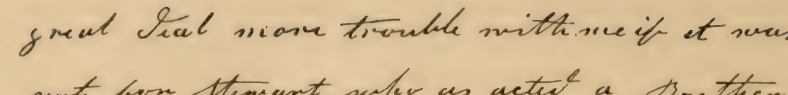
Mr. Reynolds makes some very interesting reflections on this loss and restoration of memory. He says:

"If I might venture to offer a solution, I would say it might be accounted for, from the fact that her mind was maturely vigorous. She could talk and reason as though her intellect was full grown. Consequently, the discipline required for a child was in her case anticipated.. But still, since I have written this, it does not satisfy me. Maturity of intellect, perhaps, cannot exist without memory. Has she memory? It would seem, not, yet, if she had not, why should she be able to talk and reason? It must be remembered that her intellect was in a healthful exercise. And yet, how could this be, when she had no memory to build on, no data from which to draw conclusions, more than an infant? If the whole fabric of mind had been so completely demolished that no power had shown forth from the ruins, such as the ability to talk and reason, it would not, in my view, be extraordinary. How could she talk and reason without memory? Why could she talk and reason, and yet not write? If she forgot one, why not the other? Talking is as readily acquired as reading. The destruction of memory would account for her forgetting what she did forget,

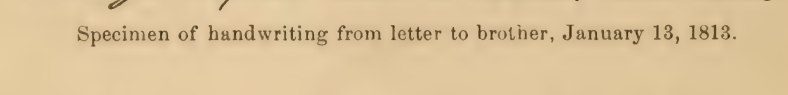
but it would go too far to prove only what we want. I can conceive of memory being destroyed, and the intellect left untouched, but I cannot conceive of its being destroyed, and yet the faculty of speech remaining. When I say, I can conceive of the memory being destroyed, and yet the intellect left untouched, I mean, I can conceive of reason being vigorously exercised, as soon as some data are presented to it from which to start, in the same way that I can conceive of reason being improved by the study of Euclid, and that improvement remaining and progressing after every proposition contained in Euclid is forgotten. But in this case, reason appears to be exercised without any data. For instance, the moment she awoke, she commenced to wonder and reason how she got there, and from whence she came. Now an infant would not have had any such thoughts, and the moment it was capable of understanding, would have believed all that was told it, whereas, she would believe nothing. However, I am only getting into difficulties and contradictions, as every one must, who talks about what he does not understand. So I'll quit."

I leave Mr. R.'s views to speak for themselves. I have thought best to quote at length some of these remarks and speculations of those familiar with this case. Clearly there is some confusion among the witnesses as to her use of language, she seems to have regained speech rapidly and writing but slowly.

Miss Reynolds' handwriting in her second state is described as somewhat different from that in her first. Only one example of her writing of her first state is extant. That is a letter addressed to her brother John, and bears the date of January 13, 1813. I have had this photographed for preservation, with her own manuscript history written about 1839 or 1840. I give here specimens of the handwriting in the two states. After the interval of twenty-six or twenty-seven years the slight differences of the writing are not unnatural. The resemblances between the writings are very visible.



Specimen of handwriting from letter to brother, January 13, 1813.



Specimen of handwriting from Autobiography, 1839–1840.

As I consider the difference in handwriting a matter of great moment, I enclosed the two specimens to my friend, Dr. Persifor Frazer, who is an expert in such matters, without telling him anything about them. His opinion, which I here append, coincides with my own, and shows how little confidence should be given to the statement made in regard to the dissimilarity in the patient's writing in the two different states of consciousness.

PHILADELPHIA, April 25, 1888.

DEAR DOCTOR: I have made a careful examination of the writing in the photographed letter and that in the MS. enclosed by you to me, and am of the opinion that the originals were both done by one hand.

This opinion is based upon a comparison of individual letters (among which I may cite the capitals M, B, I, S, and O; and the small letters y, d, h, p, s, ss, f, and t), and is fortified

by the correspondence between the forms of expression and the peculiarities of spelling in both documents, such as "indefaticable" (letter) and "indefatticable" (MS.), etc.

The probability that the same person wrote both documents is very strong. Very sincerely,

PERSIFOR FRAZER.

In the course of the letter she says:

"Since I commenced this letter to my dear brother two months have elapsed, but I can give no account of them. This morning I once more regained my recollection, but I feel very low spirited, though you will think it wrong for me to give way to it."

Some verses written by her in 1825 or 1826, and in 1830, I have also in her own handwriting, but of course in her second state.[1]

The next thing that is noteworthy is the change which took place in her disposition. Instead of being melancholy she was now cheerful to extremity. Instead of being reserved she was buoyant and social. Formerly taciturn and retiring, she was now merry and jocose. Her disposition was totally and absolutely changed. While she was, in this second state, extravagantly fond of company, she was much more enamored of nature's works, as exhibited in the forests, hills, vales, and water-courses. She used to start in the morning, either on foot or horseback, and ramble until nightfall over the whole country; nor was she at all particular whether she were on a path or in the trackless forest. Her predilection for this manner of life may have been occasioned by the restraint necessarily imposed

[1] I quote two verses as characteristic. They refer clearly to an active practitioner.

Calomel, tartar, and gamboge,
He deals me out good measure;
Could I the dose to him infuse
Would be to me a pleasure.

Blisters and drafts he makes me wear,
Two days and night together;
Oh! had I wings to take me where
I could enjoy some pleasure.

upon her by her friends, which caused her to consider them her enemies, and not companions, and she was glad to keep out of their way.

She knew no fear, and as bears and panthers were numerous in the woods, and rattlesnakes and copperheads abounded everywhere, her friends told her of the danger to which she exposed herself, but it produced no other effect than to draw forth a contemptuous laugh, as she said, "I know you only want to frighten me and keep me at home, but you miss it, for I often see your bears and I am perfectly convinced that they are nothing more than black hogs."

One evening, after her return from her daily excursion, she told the following incident: "As I was riding to-day along a narrow path a great black hog came out of the woods and stopped before me. I never saw such an impudent black hog before. It stood up on its hind feet and grinned and gnashed its teeth at me. I could not make the horse go on. I told him he was a fool to be frightened at a hog, and tried to whip him past, but he would not go and wanted to turn back. I told the hog to get out of the way, but he did not mind me. 'Well, said I, 'if you won't for words, I'll try blows;' so I got off and took a stick and walked up toward it. When I got pretty close by, it got down on all fours and walked away slowly and sullenly, stopping every few steps and looking back and grinning and growling. Then I got on my horse and rode on."

On another occasion she saw a large rattlesnake, by the beauty of which she was attracted, and attempted to capture it, seizing it by the tail just as it was escaping among some logs. Her foot slipped, and to save herself from a fall she let go the snake. She afterward thrust her arm into the hole, but it had gone beyond her reach. It was known to be a rattlesnake, both by its appearance and by its rattle. She afterward became familiar with the species and remembered that the one she had pursued was like those which she now knew.[1]

[1] The accounts given of Miss Reynolds' encounter with the bear and with the rattlesnake vary somewhat, as all human testimony does in regard to any particular event, but are in all the various memoirs of her case.

"In this peculiar state Mary's parents had no control whatever over her. She was very fond of exercising her ingenuity, in inventing tricks at the expense of others, to put them to as much trouble as possible, for the purpose of enjoying a laugh and causing others to join in it, at the ludicrous figure in which she never failed to make them appear." She was uncommonly acute and inventive, and at the same time so apparently serious and free from duplicity as invariably to impose upon the most cautious.

While she was forming and digesting some deep-laid scheme and inwardly laughing at the perfect success of her strategy, her exterior was all sedateness and profound gravity. One would then suppose that she was destitute of the power of smiling. Her appearance completely mocked the thoughts of her heart, and thwarted every effort to pry through the covering and obtain a glimpse of what was at work within. This was so well carried out that those whom she had deceived hundreds of times, and who were ever on the watch, were nevertheless imposed upon time and again, and no sooner were out of their difficulties, fully determined to be no more deceived, than before they were aware they were led into others and made a laughing-stock. It is very obvious from the account given that the return of power to use words intelligently must have been rapid.

Thus it continued for five weeks, when one morning, after a protracted sleep, she awoke and was herself again. She recognized the parental, the brotherly, and sisterly ties as though nothing had happened, and immediately went about the performance of duties incumbent upon her, and which she had planned five weeks previously. Great was her surprise at the change which one night (as she supposed) had produced. Nature bore a different aspect. Not a trace was left in her mind of the giddy scenes through which she had passed. Her ramblings through the forest, her tricks and humor, all were faded from her memory, and not a shadow left behind. Her parents saw their child; her brothers and sisters saw their sister. She now had all the knowledge that she had possessed in her first

state previous to the change, still fresh and in as vigorous exercise as though no change had been. But any new acquisitions she had made, and any new ideas she had obtained, were lost to her now—yet not lost, but laid up out of sight in safe keeping for future use. Of course her natural disposition returned; her melancholy was deepened by the information of what had occurred. All went on in the old-fashioned way, and it was fondly hoped that the mysterious occurrences of those five weeks would never be repeated, but these anticipations were not to be realized. After the lapse of a few weeks she fell into a profound sleep, and awoke in her second state, taking up her new life again precisely where she had left it when she before passed from that state. She was not now a daughter nor a sister. All the knowledge she possessed was that acquired during the few weeks of her former period of second consciousness. She knew nothing of the intervening time. Two periods widely separated were brought into contact. She thought it was but one night.

In this state she came to understand perfectly the facts of her case, not from memory, but from information. Yet her buoyancy of spirits was so great that no depression was produced. On the contrary, it added to her cheerfulness, and was made the foundation, as was everything else, of mirth.

These alternations from one state to another continued at intervals of varying length for fifteen or sixteen years, but finally ceased when she attained the age of thirty-five or thirty-six, leaving her *permanently in her second state.* In this she remained without change for the last quarter of a century of her life.

In 1836, at the request of her nephew, Mr. John V. Reynolds, then a student in Princeton Theological Seminary, she prepared an account of herself, the original manuscript of which Dr. Reynolds has given me for preservation in the library of the College of Physicians. It is addressed to her brother, and is closely written on quarto pages, in a very fine but clear hand, ending abruptly at the nineteenth page, and without signature.

Being at the time it was written in her second state, she had no recollection of the feelings or incidents of her former life, and for that she relied upon the testimony of her friends.

She says:

"From the spring of 1811 [when the first change occurred] until within eight or ten years, frequently changing from my first to my second, and from my second to [my] first state, more than three-quarters of my time I was in the second state. There never was any periodical regularity as to the transition. Sometimes I continued several months, and sometimes a few weeks, a few days, or only a few hours, in my second state; but in the lapse of five years I, in no one instance, continued more than twenty days at a time in my first state.

"Whatever knowledge I acquired at any time in my second state became familiar to me when in that state, and I made such proficiency that I had become as well acquainted with things, and was in general as intelligent, in my second state as in my first state.

. . . . . .

"These transitions always took place in my sleep. In passing from my second to my first state nothing was particularly noticeable in my sleep, but in passing from first to second state my sleep was so profound that no one could awake me, and it not unfrequently continued eighteen or twenty hours.

"I had generally some presentiment of the change for several days before the event. My sufferings in the near prospect of the transition from either the one or the other state were extreme, particularly from the first to the second state. When about to undergo the change, fearing I should never revert so as to know again in this world those who were dear to me, my feelings in this respect were not unlike one who was about to be separated by death, though in the second state I did not anticipate the change with such distressing apprehension as in the first. I was naturally cheerful, but more so at that time than in my natural state. I felt perfectly free from any trouble when in my second state; and for some time after I had been in that situation my feelings were such that had all my friends been

laying dead beside me I do not think that it would have caused me one moment's pain of mind. At that time my feelings were never moved, either with the manifestation of joy or sorrow. I had no idea either of the past or future; nothing but the present occupied my mind.

"In the earlier stages of my disease [*i. e.*, second or abnormal condition] I had no idea of employing my time in anything that was useful; did nothing but ramble about, and never tired walking through the fields. My mother one day thought she would try to rouse me a little. She told me that Paul said those who would not work must not eat. I told her it made no matter of difference to me what Paul said, I was not going to work for Paul or any other person. I did not know who Paul was, for I had no knowledge of the Bible at that time more than of anything else. However, I was very much offended at mother. I went over to your Aunt Lydia; told her I would not eat anything more at father's. She gave me a pie and some cakes, which I took home and locked up, and for some time would bring my own provision to the table, but would partake of my mother's tea and coffee. Whenever your aunt would bake she used to provide for me, and continued to do so for some length of time. I lived upon very little; have wondered how I could live upon the little food and sleep which I did. For two and three days and nights together I neither ate nor slept. It was a matter of surprise to every person who knew me. I would conceive prejudices without cause against my best friends, and those would sometimes be very strong. However, at length those prejudices began in a measure to wear off, and I became more and more reconciled to my friends."

Miss Reynolds' health was not undisturbed. She was on one occasion, at least, for an entire winter and spring, confined to her bed, so weak that she could not raise her hand to her head. During this time her transitions were frequent, but generally the second state continued for only a very short time. After her recovery from this bed-ridden condition this was her only state. During this illness pain would often seize her, while

blood rushed to her head; and as it continued her body would become rigid, as in death; not a joint or a muscle would yield, and life would seem to be extinct. This was succeeded by trembling, which violently shook the whole bed. Her mind then wandered; she talked wildly; got out of bed and walked by the hour, notwithstanding her weakness when in her right mind. At these times she walked as steadily as a person in health, and had more strength than most sane persons. All attempts to control her were vain, unless the doctor happened to be at hand, when she became as obedient as a child. At these times she was absolutely deranged in a sense, which could hardly be said of her second state. Her agony was so great as to draw tears from its witnesses, and she would clasp her head as though it were about to burst. In such cases strong plasters of mustard, mixed with vinegar, were applied to the soles of her feet, and she was daily cupped over the temples, with relief and final recovery, though still in her second state.

As before remarked, this was her state of liveliness and vivacity; extravagant fondness for fun and company. She developed imaginative powers and a strong propensity for versification and rhyming, a desire which seems to have come only with her new condition. The difference in her character in the two states was manifested in almost every act and habit.

The two lives which Mary Reynolds lived for many years were thus entirely separate; each was complete in itself, the fragments of which it was composed, though in reality separated by the portions of the other life intervening, sustained a due relation. Each state had its mental accumulations. The thoughts and feelings, the likes and dislikes, of the one state did not in any way influence or modify those of the other.

In her natural state the strange double life which she led was the cause of great unhappiness. She looked upon it as a severe affliction from the hands of Providence.

At the time of her first change her brother John was living in Meadville. Hearing of her remarkable condition he visited her at the old homestead. Of course she did not recognize him. But having been told of his relationship to her she soon

became warmly attached to him, and her affection grew as he repeated his visits during her continuance in the second state.

Miss Reynolds became very anxious to visit her brother in Meadville, but her friends did not think it advisable to give her permission. Between one and two years after the first change, and while in her second state, she left home on horseback—an exercise of which she was very fond, and in which she was freely indulged—under pretence of visiting a neighbor. She made the visit (for she always carefully kept the letter of her word, though not always the spirit), but she made her visit very brief and then rode to Meadville, a distance of nearly thirty miles. Her family soon learned where she had gone and allowed her to remain several weeks. During that time she was the guest of Mrs. Kennedy, and shared a room with Miss D., another guest in the same family. The two girls becoming strong friends, agreed to play a practical joke on Mr. Reynolds. But it happened that neither of the young ladies awoke at the right time, and when Mary arose in the morning she had passed into her natural state.

She now found herself in a strange house, for she had never been in Meadville in her natural state. She had for a sleeping companion a person who was a total stranger. She saw nothing with which she was familiar, and could not imagine where she was. Being, in her natural state, quiet and shy, she asked no questions. Miss D. spoke of the trick which they had proposed to play, but had not waked to perform. Miss Reynolds made no reply. She remembered nothing of the trick, and knew not who it was that addressed her. She dressed herself and found her way down stairs, wondering and perplexed, but waiting to see what would happen, and hoping that something would soon occur that would solve the mystery. Mrs. Kennedy came into the room and spoke in her usually cheerful manner, but Mary knew her not. Soon afterward her brother John entered the room; then all was at once explained. In both states she knew him. In both states she knew that he resided in Meadville. So she knew she must be in Meadville. She informed him of the occurrence of the change, though there

was little need of it, for it was obvious to all. She was introduced anew to those among whom she had so strangely fallen. She remained at Mrs. Kennedy's, in Meadville, for some days and then returned home. Very soon after her return she awoke one night, and arousing a sister with whom she was sleeping, she exclaimed, "Come, Nancy! It is time to get up and play that trick on John!" She had changed into her second state and supposed that she was still in Meadville and sleeping with Miss D., and that it was the same night on which they had planned the joke. When she found she had returned to the "Nocturnal Shades," as she called her home in Venango when she was in her second state, she was much chagrined, for the larger society which she found in Meadville was, in that state, much more to her taste.[1]

For a length of time, while in state 2, Miss Reynolds, after falling asleep at night, used to repeat audibly and in regular order all that she intended to do on the following day. This would occupy some minutes, and then she would cease. Thus, by listening, her friends were made acquainted with her projects, and were ready to thwart them if necessary. The next day she would, if permitted, do all that she had planned and in the same order. She was her own tell-tale. She could not imagine how her plans could be known. It was at length discovered by her friends, to their great joy, that a person by assuming an air of command, and imposing on her positive injunctions, could control her. But only one person had this power. To the remainder she paid no more regard than to the chirping of a cricket. The singular part of this was that the influence arose from no affection for that particular person nor from any especial fear, for it was sometimes one and sometimes another, but never more than one. There seemed to be no more reason for her obeying that one than any or all of the

[1] Her exclamation was, "Oh! what a change; transmigrated from the height of happiness into these nocturnal regions, where nought but sullen silence reigns and death-like inactivity slumbers." She said she could not think of spending her days "among these poor half-awakened sons of Jupiter," and exacted a promise for her return to Meadville.

others. It was necessary to speak with the voice of authority and firmness, and to obtain promise of obedience in every case, otherwise she would not obey. But her promise could be obtained and was never violated. If, however, her promise was not of sufficient minuteness to enclose her in on every side by an insurmountable wall she would profit by the laxity. If a solitary chink were left unclosed, she would squeeze her conscience through it. One morning the person in authority said to her, "You must not ride over the hills to-day." She promised to obey, but so soon as he had gone out she got a horse and was gone all day. In the evening when she had returned he said to her, "Did I not tell you not to ride to-day?" "No." "I certainly did." "No, you did not; you told me not to ride over the hills, and I have not, but I have ridden through every valley I could find." They were surrounded by hills, and there was only one way she could go to shun them, and that was along a little rivulet which passed near the house.

She used to go on cold nights, when a hunt was proposed by her brother for the next day, and take the hunting coats and carry them a mile or two miles to some neighboring house and leave them there. The next morning the articles would be missing, and neither the loser nor the finder would be able to account for them. On one of these occasions she passed over Oil Creek on the ice when the water was very high and the ice so very thin that her safe passage was a matter of great surprise. One stormy night in winter, such a night as one would pity a dog to be exposed, she got up and went to the doctor's, whom she did not like, but who had at this time the control of her. As her physician he imposed on her many restraints. With a man's cloak and hat on she knocked at the door and got him up, and told him he must go immediately to a certain house, a long distance away, where a man was almost dead from injury. The doctor, poor man, went, but only to find the family fast asleep. Such experiences were not likely to sweeten the relations between doctor and patient.

When in her most lively moods, the sight of the doctor produced a most laughable and instant change. One moment all animation and hilarity, full of laughter and jokes; the next

she was the very picture of gravity. Neither the doctor nor any one else who was present could then get from her more than the monosyllabic "yes" or "no." No sooner would he be out of sight than she would resume her gaiety and laugh heartily at the way she had cheated the doctor. It was finally found necessary, from the bad state of her nerves and general health, to prohibit her from going into company, and the doctor told her she might walk, but she must not go into any neighboring houses. The wily creature, however, would stand at their windows, and when asked to enter would say, "No; the doctor says I must not, but he did not tell me I must not talk at the windows."

Her vivacity, wit, and good humor were so great that her acquaintances all desired her company, and would not inform on her. But one day the doctor saw her, and as he came toward her her countenance settled into dismay and gravity, as she said "I'm done now. The doctor has caught me at last." If at any time she would suddenly change from levity to gravity you might be certain the doctor was in sight. If the contrary change, he was out of sight.

The mental disturbance which at times characterized the earlier portions of her second state grew fainter, and at length wholly disappeared, leaving her permanently altered in character. This dates from about the year 1829, when she had reached her thirty-sixth year. In this state she lived the remainder of her life, a period of twenty-five years. During this quarter of a century no one could have discovered in her anything out of the ordinary way, except that she manifested an unusual degree of nervousness and restlessness; yet not enough to excite remark.

It is to be borne in mind that she was still in this her abnormal state all the rest of life, without memory although not without knowledge of her true self. The change from a gay, hysterical, mischievous woman, fond of jests and subject to absurd beliefs or delusive convictions, to one retaining the joyousness and love of society, but sobered down to levels of practical usefulness, was gradual. The most of the twenty-five years which followed she was as different from her melan-

choly, morbid self as from the hilarious condition of the early years of her second state. Some of her family spoke of it as her third state. She is described as becoming rational, industrious, and very cheerful, yet reasonably serious; possessed of a well-balanced temperament and not having the slightest indication of an injured or disturbed mind. For some years she taught school, and in that capacity was both useful and acceptable, being a general favorite with old and young.

During these last twenty-five years she lived in the same house with the Rev. Dr. John V. Reynolds, her nephew, part of that time keeping house for him, showing a sound judgment and a thorough acquaintance with the duties of her position.

Dr. Reynolds, who is still living in Meadville, and who has most kindly placed the facts at my disposal, states in his letter to me of January 4, 1888, that at a later period of her life she said she did sometimes seem to have a dim, dreamy idea of a shadowy past, which she could not fully grasp, and could not be certain whether it originated in a partially restored memory or in the statements of the events by others during her abnormal state.

Miss Reynolds died in January, 1854, at the age of sixty-one. On the morning of the day of her death she rose in her usual health, ate her breakfast, and superintended household duties. While thus employed, she suddenly raised her hands to her head and exclaimed "Oh! I wonder what is the matter with my head!" and immediately fell to the floor. When carried to a sofa she gasped once or twice and died.

NOTE.—A brief abstract of this case, taken from the *Medical Repository*, is given by Prof. H. C. Wood, in his work on *Nervous Diseases and their Diagnosis*, Phila., 1887, p. 372. Following it are abstracts of the more or less similar cases of Dr. Azam, *Annales Méd. Psych.*, 1876, vol. xvi.; Dr. James Mayo, *Lond. Med. Gazette*, vol. i., 1845; Dr. Samuel Jackson, *Amer. Journ. Med. Sci.*, 1869, p. 18, with a reference to a case of his own following depressed fracture of the skull. Azam's, Mayo's, and Jackson's cases were all girls from fifteen to eighteen. Dr. Wood's case was that of a man.

[After the reading of the preceding paper:]

Dr. H. C. Wood said: With regard to the name of this condition, I think that double consciousness is about as bad a term as could be selected. I think that the condition does not have much to do with consciousness. In the first place, there is absolute failure of memory, which accounts for many of the phenomena. It, however, does not account for the change of character. It seems to me that the state is made up of the two things, change of character and failure of memory. It is not so unparalleled in our ordinary experience as it seems. Every case of insanity presents part of the features of so-called double consciousness. I remember, for instance, a lady suffering with melancholia. In her natural state she was refined; elegant in her manner and address; very thoughtful of the opinions and of the feelings and rights of others. In her condition of protracted melancholia she was rather coarse and rude in her acts; utterly jealous, with a tendency to be coarse in her language, and thoroughly disregarding the rights of others. There was a change in character. While in her usual condition she would say that the cloud of melancholia was coming again, and within half an hour she would be bowed down in the deepest religious melancholia. So in most cases of insanity this element of change of character enters. In one of these cases of melancholia there is a record of what might be called double consciousness. One day the man was profoundly apathetic; overwhelmed by the deepest religious melancholia. The next day he was a bright active business man, having no memory of the previous day. So he went on through many years. That was a case of alteration of memory and of alteration of character, with marked symptoms of religious melancholia.

I cannot see myself, that if we do not consider insanity mysterious, why we should consider these things mysterious. They are to my mind different degrees of the same condition. I have known cases of failure of memory as absolute as that in the case reported to-night. Such failure may result from

sunstroke. In 1876 a gentleman fell over with sunstroke and was taken to the hospital. Although he became perfectly rational within a short time, it was five days before he could tell what was his name or where he came from, or give any account of himself. As I have said, failure of memory and change of character seem to make up the whole of this condition of double consciousness, so-called.

Dr. Henry Hartshorne said: It seems to me that a marked difference between those cases of insanity referred to by Dr. Wood and such cases as that reported to-night is the abruptness and the totality of the alteration.

It may be not entirely without interest to speak in this connection of the possible separable junctions of the two hemispheres of the brain. Brown-Séquard, in a paper published some years ago, maintained that each hemisphere is capable of performing all the functions of the brain. If, then, we could suppose that by some interruption of the function of the corpus callosum, or in some other manner, there should be a totally separate action of one hemisphere from that of the other, I think there would be some suggestion of an explanation. I remember a case of brain disease in the hospital, the patient stating that he could think pretty well with one side of the brain, but hardly at all with the other. There probably was some physical basis for this remark. I knew a lady, occasionally a patient of mine, for some years who had alternation of character without being insane. In the one condition she was very amiable and reasonable, and in the other quite unamiable and decidedly unreasonable in behavior. There was, in this case, a marked difference in the size of the two sides of the head, one side being perceptibly smaller than the other. She subsequently became insane. In the absence of any other explanation, I would suggest this: the different action of the hemispheres, sometimes one and sometimes the other being predominant in determining the individual's mental condition and conduct.

Dr. Charles K. Mills said: It seems to me that the relations between these conditions of alternate consciousness, or periodic amnesia as they are sometimes called, and epilepsy, are more striking than those between epileptic insanity and these states. Every one who has had much experience with insanity must have seen many instances of alternate consciousness. It is, however, rare that we have these long periods in which these different conditions persist, and yet occasionally these long periods are to be seen. About a year ago I published in the *Polyclinic* (April, 1887) a lecture on the disorders of consciousness and of memory, in which I gave a number of instances, chiefly taken from private practice and the wards of the Philadelphia Hospital, illustrating this point. I also detailed the case of a man, whom I still see occasionally, who very well illustrates this condition of double consciousness or alternate consciousness.

It seems to me that if the case described by Dr. Mitchell was one of this sort, it is probable that the first attack was an epileptic seizure, and that some of the others may have been of this character. In some particulars the case strikes me as not so clearly a case of double consciousness as some of the other cases which have been reported. The condition is comparable in a measure to certain forms of insanity, such as the insanity of "double form," in which the patient may remain in a state of mania for a long time and then pass into a condition of melancholia, etc.

My experience, with reference to these cases, has been striking in that in many of them there has been a history of injury of the head. Instead of the idea of the two hemispheres of the brain acting separately being of service in the explanation of these cases, its acceptation might, in some respects, interfere with a satisfactory explanation. With our present physiological knowledge the different methods of functioning of the different levels of the general cerebro-spinal axis would better explain this condition.

Dr. Mitchell said: The case that I have reported is peculiar in that there was a considerable loss of memory of words.

Words were almost entirely forgotten, but rapidly relearned. In most cases of double consciousness there has been enfeeblement of memory of words; in others a perfect recollection of verbal language.

There is this great difference between cases of true double consciousness and insanity. In insanity there is not merely change of character, there is something more than that. These cases of double consciousness show simply changes of a sane character. We have two individuals, both sane, but having different characters. In illustration of this I may refer to the case of a clergyman who was found at Norristown, and whose history I am trying to get at length. He was an itinerant minister from Rhode Island. One day he left his home and found himself, or rather his other self, in Norristown. He had a little money and bought a small stock-in-trade. Instead of being a devoted religious preacher of the Methodist persuasion, he turned out a shop-keeper in Norristown, carrying on for two years a trade in toys and candy, cooking for himself and sleeping in the back of his shop. He paid his rent regularly and in all respects acted like other people. At last, in the middle of a night, he woke up to his former consciousness, and finding himself in a place with which he was not acquainted, he supposed that by some strange mistake he had gotten into a shop of some one, and that he might be taken for a burglar. This threw him into a condition of great alarm, and in this state he was found by the neighbors. He stated that he came from Rhode Island. His friends were communicated with and he was reclaimed. This man got back to his original condition instantly.

This woman whom I have reported had two states. In the one she was melancholy; in the other bright and vivacious; and in the final state into which she passed she united these two and became gradually a cheerful-minded lady, not unlike other people. In either case it does not read like the history of insanity.

Undoubtedly the case I have described was of hysterical origin. Some attacks are described in which she became rigid,

and remained so for some time, and exhibited every evidence of the hysterical condition. I see no analogy to epilepsy in these cases, and I do not see to what they are analogous. In their causes they are related to hysteria. To describe this woman as being for twenty-three years in a state of mild excitation, as Dr. Mills has done, seems to be carrying the view of insanity pretty far.

NOTE ON THE TREATMENT OF SYPHILIS BY THE HYPODERMATIC INJECTION OF CALOMEL.

By

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[Read April 4, 1888.]

The treatment of syphilis by the intramuscular injection of calomel, as first practised by Scarenzio, in 1864, was prominently brought to the notice of the profession in Germany by Neisser, in September, 1885. Since that time a large number of communications upon this subject have appeared in the German, and more recently in the French journals. It is a remarkable fact, however, that this method of treatment has received but little notice among English and American physicians. Two papers only, those of Bloom and Morrow, have thus far appeared in American literature. Neither of these has embodied any extended clinical observations, a fact that is more noteworthy in view of the multiplying reports of the growth of this method of treating syphilis on the Continent, and especially in Germany.

The object of the present communication is to call attention to the details of this treatment as practised by the writer, and its results in a limited series of cases. The method is the natural outcome of efforts to render

the treatment of syphilis more exact, and to keep it more completely within the control of the physician by the administration of specific remedies hypodermatically. It marks a step in the advance of the therapeutics of syphilis beyond the hypodermatic use of the soluble salts of mercury, as the bichloride, formerly advocated, and still occasionally employed in cases in which it is necessary to obtain the full effect of mercury rapidly. The difference between the therapeutic effects of the soluble and insoluble mercurial salts hypodermatically injected is, however, an important one. In the case of the former, absorption readily occurs, and the effects of the drug are manifested with great promptitude; thus, Hutchinson quotes Bloxam as saying that one-third of a grain of bichloride of mercury dissolved in twenty drops of water and repeated hypodermatically on three consecutive days, will usually salivate freely; whereas the insoluble salts, introduced by the hypodermatic method, undergo chemical changes in the presence of the fluids of the tissues with comparative slowness, thus keeping up a prolonged and relatively mild influence until their chemical conversion and absorption are completed. The gradual nature of this process is shown by the fact that, in one of my cases, slight ptyalism occurred on the ninth day after the injection of one grain of calomel. Much difference of opinion has been expressed as regards the relative advantages of the mode of treatment under consideration; the greater number, however, of those who have published their observations regard it as possessing certain positive advantages over the methods hitherto practised. Among these advantages may be named the following:

A. As over the administration of the preparations of mercury by the mouth:

1. The absence of any directly unfavorable influence upon the digestive apparatus (nausea, loss of appetite, colic, diarrhœa), especially in cases where mercury in sufficient doses is not well borne.

2. Precision of dosage.

3. Control of the administration by the physician, and, therefore, better opportunity, especially in private practice, to observe the effect of the drug, as well as the general condition of the patient, at fixed intervals.

4. Simplification of the treatment as regards the patient himself, and diminution of the liability of his condition becoming known.

5. Promptness of action.

6. Diminished risks of salivation.

B. As over treatment by inunction, in addition to the above advantages, we have:

1. Absolute cleanliness. This point is of much importance in private practice. Mercurial inunctions are not acceptable to the better class of patients, and are feasible only in cases where the symptoms are urgent, and the patient fully realizes the gravity of the situation.

2. Convenience of administration in all respects.

C. As over the treatment by fumigation, etc., in addition to the above, we have:

1. Comparative safety of the method of treatment.

2. Absence of the necessity for attendants, and for the use of apparatus of any form on the part of the patient.

D. As over other forms of treatment in ordinary use: the fact that stubbornly rebellious symptoms often yield

with promptness to hypodermatic injections of the insoluble salts.

The disadvantages of this treatment, as compared with the methods in general use, are:

1. Pain.
2. Danger of the formation of abscesses.

It may be said at this point that both of these disadvantages are reduced to a minimum by attention to the details of the little operation, and especially by the observance of the rule to introduce the medicament deeply into the substance of the muscle.

Some degree of burning pain is, however, produced by almost every injection. It is, as a rule, moderate, and comes to an end in the course of a few minutes. It is, on the contrary, however, sometimes quite severe. Exceptionally, the injection has caused no pain whatever beyond the mere prick of the needle.

The danger of the formation of abscesses is very slight when the injection is properly performed. Antisepsis must be complete as regards the material injected, the syringe, and the patient's skin at the point of puncture, and the calomel must be thrown deeply into the muscular substance, the needle being entered perpendicularly to the plane of the surface. The most convenient site is the lateral aspect of the gluteal region in the fossa behind the great trochanter. Smirnoff and Sofiantini state that calomel injections in this region are never followed by abscesses. Schadek says "abscesses never occur after deep intramuscular injections of the quicksilver preparations; coagulations—that is to say, nodes and induration at the point of injection—are rarely seen." Watrazewski saw only 4 abscesses follow 257 calomel injections. In my own private practice, in

thirty-two injections in six patients, once only slight fluctuation occurred at the seat of puncture. It disappeared in the course of a few days. In the cases treated at the Philadelphia Hospital, several small, superficial abscesses developed at the point of injection. These were among the earlier cases, and the procedure was practised without due regard to antisepsis.

On the other hand, Kopp and Chotzen counted 48 abscesses after 768 injections of 0.1 of a gramme (1.5 grains) of calomel. Krecke caused suppuration of the subcutaneous tissue in 21 instances out of 171 injections, while Monti, Bockhardt, and others have abandoned the treatment on account of this danger.

There can be no doubt, in view of these varying results, that the occasional formation of abscesses is due to faults in technique. It is, therefore, largely, if not indeed wholly, avoidable, and constitutes no real objection to the treatment.

Two of the insoluble salts of mercury have been used, calomel and the yellow oxide. My own observations have been made with calomel alone. Neisser suspended the calomel in water with a little gum Arabic. The original formula was

Calomel, Sodii chlorat.	. . . . .	āā 5.0.
Aquæ dest.	. . . . .	50.0.
Mucilag. acaciæ	. . . . .	2.5.

The formula given by Bloom is,

Calomel by vapor	. . . .	5.0 (℈iv).
Sodii chloridi	. . . . .	1.25 (℈j).
Aquæ dest.	. . . . .	50.00 (f℥xiijss).

It is obvious that this mixture defeats the object of the treatment in view of the rapid chemical changes by which bichloride of mercury and metallic mercury are formed at the expense of the calomel. After some experience, calomel was administered by various observers in suspension in liquid vaseline, by others, in pure olive oil. One of the difficulties of the injection of calomel is found in the liability of the needle of the ordinary hypodermatic syringe to become clogged. For this reason both the vaseline and oil are objectionable. My own injections, after a few early trials with the above substances, have been made with glycerine, as suggested by Smirnoff, and in order to secure greater accuracy of the dose and to overcome the tendency of the calomel to settle at the bottom of the vial, I order the doses from the apothecary, separately, in drachm vials, each containing

Calomel by vapor	grain 1.25.
Glycerine (pure)	♏xv.

A number of these vials are ordered at once, and are protected from the light. At the time of using, the cork is removed and a few minims of recently boiled water are forcibly injected from the needle of the syringe into the bottle in order to displace the calomel that has settled. The bottle is then thoroughly shaken until the calomel is suspended. The mixture is next poured into a little conical porcelain capsule and quickly taken up through the nozzle of the syringe. The needle is then adjusted, the air expelled, and the operation performed in such a manner that the drug is thrown into the muscular mass. A grain of calomel, approximately, is the usual dose. The formula calls for one and a

quarter grains, for the reason that, notwithstanding the greatest promptness, a certain amount of the calomel remains at the bottom of the capsule, and a little in the syringe itself.

The antiseptic precautions consist in thorough disinfection of the apparatus employed, immediately before each injection, by means of water boiled for some minutes in a test-tube, and in the careful cleansing of the skin at the point of puncture, by a solution of corrosive sublimate 1 : 1000. Burning pain usually follows, lasting for some minutes, and the circumscribed deep infiltration, which may be detected after the injection, becomes the seat of moderate tenderness, and more or less induration, lasting for some days, or even a week or two.

When we come to consider the transformations which the insoluble mercurial salts undergo when thus injected, we enter a field as yet but little investigated. It is probable that to a slight extent chemical reactions take place with certain organic principles, notably albumen, with the formation of albuminate of mercury, but that the greater part of the calomel undergoes, in the constant presence of the alkaline fluids of the tissues, gradual conversion into a double chloride of mercury and sodium. In this respect it follows the course of mercury introduced into the economy by way of the alimentary canal.

The following cases were treated in the Philadelphia Hospital, and the notes are condensed from the ward histories taken by Dr. Hutchinson, Resident Physician.

Case I.—J. A., male, æt. forty-eight; admitted September 23, 1887, to Medical Ward 2, bed 10; Irish, a store-porter, moderate drinker. No hereditary tendency to disease of the nervous system. Chancre in 1861 or 1862; lymphatic enlarge-

ment; stubborn faucial and buccal symptoms; no recollection of a rash; prolonged treatment by mercury. In 1867, spinal symptoms, staggering gait, dizziness, and difficulty in holding his water. Systematic treatment for two years, with complete recovery. He then married; wife's first pregnancy resulted in miscarriage. The second child was healthy, and is still living. Four children born subsequently died in early infancy from "marasmus." In 1875 there was recurrence of the spinal symptoms; he then was treated in the Orthopædic Hospital; states that recovery rapidly took place under strychnia and increasing doses of iodide of potassium; continued well until the spring of 1887, when spinal symptoms recurred, together with loss of sexual power and desire, marked ataxia, burning sensations and numbness, especially in the limbs and feet. Knee-jerk much exaggerated in both legs. Examination of the eyes by Dr. de Schweinitz showed insufficiency of the internal recti, oval disks distinctly gray in the second layer, and distention of the lymph sheaths along the arteries and veins; no distinct retinal changes except haziness. Diagnosis as to eyes, probable early gray degeneration of the optic nerve. Hypodermatic treatment from November 11, 1887, to February 17, 1888; total number of injections, seven: result, very decided improvement. Patient transferred to the surgical ward, for the treatment of cystitis.

Case II.—G. M., male, æt. thirty-seven; admitted to Medical Ward 2, bed 2, September 28, 1887. Primary sore occurred in 1876; secondary lesions of the mouth and throat, with falling of the hair; no recollection of a rash. Two years later, symmetrical, circumscribed ulcers of the shoulders and thighs, the scars of which remain. In 1879, sharp pains in the knees and ankles, lasting for some months, and disappearing under treatment. In 1886, acute pain and swelling of the knees and ankles, always aggravated at night, kept him in bed for eleven months. Upon admission to the Hospital, there was well-marked periostitis of the clavicles, tibiæ, and radii. Slight improvement only under large doses of iodide of potassium. On December 11, 1887, other medication having been stopped,

he was given calomel hypodermatically, and had in all five injections at intervals of a fortnight. Very decided improvement. He was subsequently treated by Dr. Bruen with hypodermatic injections of bichloride of mercury.

Case III.—J. J., male, æt. thirty-seven, Italian laborer, admitted to Medical Ward 8, bed 9, December 24, 1887, complaining of vague pains in various parts of the body and constant headache. The initial lesion occurred five weeks prior to admission. Lesions of the tonsils and throat. About January 16, 1888, well-characterized macular eruption appeared over the whole body; enlargement of the superficial lymphatic glands. January 17th, hypodermatic treatment begun, and he received in all eight injections. On March 23d, the following note was made: "The patient better in every respect; the eruption has disappeared; the superficial lymphatics have undergone resolution; the patient free from pain and feels perfectly well. He has had at no time any stomatitis or diarrhœa." This patient received on one occasion two grains of calomel by hypodermatic injection. A superficial abscess occurred at the site of one of the injections.

Case IV.—C. McG., male, aged twenty-eight, Irish, blacksmith, admitted to Medical Ward 8, bed 10, January 27, 1888. The initial lesion occurred October 1, 1887. He suffered with severe pains in the head, arms, and body; considerable induration about the point of the chancre on the dorsal aspect of the penis in the sulcus. Inguinal lymphatics much enlarged, also the post-cervical and epitrochlear glands. A profuse papular eruption covered the whole body. The treatment by calomel, hypodermatically, commenced January 28th, and he had in all nine injections. During the course of the treatment an abscess formed at the side of the neck, and two or three small abscesses formed in the gluteal region at the site of the injection. There was no stomatitis or diarrhœa. Within two months of the beginning of the treatment the sore on the penis had healed, the glands had undergone resolution to a considerable extent, and the eruption had disappeared, with the exception of a few scaly papules in the region of the lips, the lower part of the

abdomen, and the thighs. March 15th, the patient was still doing well.

Case V.—L. S., male, æt. twenty-five, roofer by occupation, American, admitted to Medical Ward 2, bed 18, February 25, 1888. He first observed the initial lesion some time during the autumn of 1887. There was phimosis, for which circumcision was performed. Secondary symptoms, sore throat, constant headache, enlargement of the superficial lymphatics, uniform papular rash over the body and legs. Treatment was commenced February 26th. In all six injections were given up to March 15th, when it was noted that the glands were undergoing resolution, that the rash had, to some extent, faded, that the headache had disappeared, and that his general condition was improving. There were no abscesses, no sore mouth, and no diarrhœa.

Case VI.—J. F., æt. twenty-five, Irish, admitted to Medical Ward 8, bed 24, October 20, 1887. The initial lesion occurred fifteen months before admission, and was followed by non-suppurating enlargement of the glands of the groin. He had suffered with iritis in both eyes, but not at the same time. Severe periosteal and articular pains. Treatment by hypodermatic injections of calomel was commenced in January, 1888. After the second injection the patient refused to continue the treatment on account of the pain attending it.

The following cases were treated in private practice:

Case VII.—X., male, æt. forty-five, a man of leisure, had the initial lesion in 1873. Intense and protracted secondary lesions affected the mucous membrane of the mouth and the cutaneous surface; prolonged mercurial treatment. A period of about five years passed without symptoms of any kind. In 1881 there appeared extensive, stubborn ulceration of the tongue, very little modified by treatment by mercurials and iodides, and local treatment with nitric acid. He came under my observation in 1882. There was deep serpiginous ulceration of the left border of the tongue, with extensive cicatrices

of the right border; scaly eruption of the palms of both hands, not symmetrical, with deep, linear, fissured ulcers of the flexures; thick, scaly patches upon the soles and borders of both feet, with considerable thickening of the skin; a large, scaly patch on the left side of the scrotum. Decided improvement under alternating courses of iodide of potassium and protiodide of mercury, with frequent applications of nitrate of silver to the lingual ulcers. The latter in the course of a few months had healed, and since have only occasionally, and for short intervals, given trouble. The scaly patches have undergone occasional improvement, but never disappeared, notwithstanding the fact that the patient has been steadily under observation to this date, and for most of the time under treatment. Mercurial inunctions, although frequently proposed, have never been practised, owing to the patient's unwillingness to subject himself to the inconvenience. Treatment by hypodermatic injections commenced November 4, 1887, and was continued somewhat irregularly until the end of February, 1888, five injections in all having been administered. After the second injection, the scaly patches upon the hands, feet, and scrotum absolutely disappeared. On the ninth day after the first injection slight salivation was noted.

Case VIII.—F. H., male, æt. thirty-two, a travelling salesman; came under observation with the initial lesion in April, 1886. I had the opportunity of seeing the female from whom the disease was contracted, then suffering from intense secondary symptoms. F. H. developed in due course of time superficial ulcers of both tonsils, mucous patches, macular rash, and enlargement of the superficial lymphatics; none of these symptoms, however, being intense. The general health continued good. After a year of systematic treatment with protiodide of mercury, with occasional brief intermissions, the patient still presented a few reddish, scaly papules upon the forehead, at the edge of the hair, and upon the fingers and the legs, these lesions, however, not being symmetrical. In March, 1887, iodide of potassium was given in moderate doses, and

continued until November, 1887, with the effect of modifying but not curing the cutaneous lesions.

Hypodermatic treatment commenced December 10, 1887. It was interrupted by the absence of the patient from the city until February 16, 1888, when the second injection was administered. The patient was unable to return until March 10th. He then stated that after the second injection a very decided improvement in his symptoms had occurred, and requested that the treatment should be regularly continued. From that day until the present time he has received four injections at intervals of a week, making six injections in all. The lesions have entirely disappeared.

Case IX.—Mrs. R., widow, æt. thirty eight; was sent to me from the central part of Pennsylvania, by a medical friend, February 10, 1888. She had been ill three years with a teasing cough, attended by scanty expectoration, occasional night-sweats, but without loss of flesh. She had consulted a number of physicians without benefit. The appetite was fairly good. The temperature as taken in the mouth at 4 P.M. was normal. There was dulness over the right lung anteriorly in the mammary region, with abundant subcrepitant and crepitant râles heard in the infra-clavicular area and extending down the anterior border of the lung. Percussion elsewhere yields good resonance, and especially is this noted in the supra-clavicular region on both sides. Examination of the sputum showed no bacilli.

February 27. The signs not having changed, and the patient having a normal evening temperature, the history was carefully investigated. There was no hereditary tendency to phthisis. The patient married twelve years ago a man somewhat younger than herself, whose occupation compelled him to be much absent from home. Within a year the wife miscarried at the sixth month. Two years later a child was born apparently healthy. It developed snuffles when one month old and died at the age of four months of "marasmus." The husband complained from the time of marriage of frequent severe headache. The attacks of headache, after a time, became so

violent that he was obliged to discontinue his occupation for periods of several days together. Later the headaches were followed by confusion. There is no history of any special condition of the eyes nor of paralysis until about three years before his death. At this time he was seized with unconsciousness and irregular palsies. This attack was not followed by recovery. On the contrary, his mental condition became progressively feeble. He lost the power of locomotion and died paralytic one year ago.

Mrs. R., his widow, informs me that shortly after her marriage she had sore throat, which lasted for more than a year despite treatment, and that at that time she almost wholly lost her hair, which, however, afterward grew in; does not recall any eruption.

29*th*. Treatment by hypodermatic injections was commenced and has been continued up to the present time, five injections having thus far been administered. The area of percussion dulness is much less extensive, the subcrepitant râles are not heard, and a few crepitant râles only can be elicited on forced inspiration after efforts of coughing. The diagnosis in this case is not, perhaps, positive, but there is warrant for the assumption that these symptoms and signs are due to gummatous infiltration of the lung.

Case X.—Mrs. S., æt. fifty-six; has suffered for many years with intense paroxysmal headaches, accompanied by disturbance of hearing and hallucinations, followed by deep stupor at intervals of from six weeks to three months. These attacks last from two or three to six or eight days. In the intervals there is a feeling of confusion and dull headache, easily excited by mental or physical effort. General nutrition good. The eye-grounds have been examined by the late Dr. Little and by Dr. William Thomson with negative results. The urine has never been albuminous. There is no cardiac disease. No history whatever is to be obtained in this case. The patient's husband presents no indications of having suffered from syphilis. There are three grown-up daughters all in good health. The oldest, however, has, to a well-marked degree, the physi-

ognomy of hereditary syphilis, with characteristic narrowing and notching of the upper central incisors. This deformity was so conspicuous that she had the teeth removed and replaced by artificial pivoted teeth. The other daughters show nothing characteristic. The symptoms of this patient never improved under mercurial treatment by the mouth or under iodide of potassium. On several occasions mercurial inunctions have been followed by a cessation of the headaches for a period of some months, and a mitigation of the severity of the paroxysms upon their recurrence. On more than one occasion she has been ptyalized as a result of this treatment. Treatment by the hypodermatic injection of calomel was commenced November 20, 1887, and continued at intervals of, at first, a week, and later two weeks, until the present time. Eleven injections in all have been administered. From the time of the commencement of this treatment the patient, although suffering from occasional dull headache and the old sense of confusion, has had no recurrence of her attacks.

Case XI.—N. S.; female, æt. seventeen; the third child of syphilitic parents, with the typical facies of hereditary syphilis, prominent frontal bosses, sunken nose, and notched teeth; developed at the age of fifteen interstitial keratitis, with double iritis, resulting in total blindness. She was successfully treated by Dr. Charles S. Turnbull, improvement gradually taking place under frequently repeated small doses of biniodide of mercury. Within a year there has appeared a copious, thick-set, acneform eruption, most copious over the sides of the face, the shoulders, and the thighs. This eruption has the color of lean ham; is papular and occasionally pustular. The hypodermatic treatment was commenced March 2, 1888, and has been repeated at intervals of ten days, three injections in all having been administered up to the present time. Under this treatment the eruption has rapidly improved, a large proportion of the papules have entirely disappeared, and those which remain have lost their vivid copper-red color.

Case XII.—B., aged forty-one; was seen in consultation December 31, 1887, with Drs. C. M. Wilson and Murray Ches-

ton. The details of the history were not known, further than that he had been under the care of an ophthalmic surgeon for serious syphilitic eye trouble, which had improved under specific treatment. The patient had been disinclined to take care of himself, or to follow the directions given by his medical adviser. The day before he came under observation he had complained of unusually severe headache upon the left side, and had gradually lost power of the right arm and leg. When seen he was completely aphasic; the intelligence was clear. Two hypodermatic injections of calomel were administered, but in view of the gravity of the case, and lack of experience in regard to this treatment, it was abandoned for mercurial inunctions, under which the patient rapidly regained his speech, and, to a certain extent, the use of the paralyzed side. The treatment is now being conducted by a female evangelist of the "faith-cure," under whose care the patient had been for some weeks prior to the attack in which I saw him.

Whole number of patients treated, twelve; injections, sixty-nine.

My thanks are due to Dr. Hutchinson, Resident Physician at the Philadelphia Hospital, for his interested and painstaking assistance in this clinical study, and to my colleagues, Drs. Bruen and Steinbach, for courtesies in regard to the observation of cases transferred, under the rules of the Hospital, to their wards.

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[After the reading of the preceding paper:]

Dr. John B. Roberts said: I am sure that no one has a higher opinion of Dr. Wilson's medical skill than I, for it is probably to his skill that I owe my presence here to-night, but when this method requires that we shall have an aseptic syringe, an aseptic solution, an aseptic buttock, and an exposed buttock, it appears to me that the administration by the mouth of the green iodide of mercury affords a much more convenient method of treatment. My impression is that most physicians do not give the green iodide in sufficiently large doses, and hence the struggle for other methods of introducing mercury. The green iodide seems to me to be non-irritating, and easily taken in larger doses than are recommended in the text-books or used by most practitioners. Yesterday I had in my office a girl of fourteen years of age, the subject of inherited syphilis, who has conveniently taken for four days one-half a grain of the green iodide three times a day. Her brother, aged about five years, has taken as much as three-quarters of a grain three times a day. In such doses the results are so prompt that it seems almost unnecessary in the majority of cases to go to the trouble of introducing any salt of mercury under the skin, a method which is certainly accompanied by objections.

Dr. F. P. Henry said: I believe the treatment of syphilis by the injection of mercury under the skin to be a valuable addition to our therapeutic resources. I have not used calomel, nor am I likely to do so, because my success with corrosive sublimate and the bicyanide of mercury has been so great as to leave little to be desired. In one case of tubercular syphilide of a tertiary character, with large patches upon the left forearm, the back, and both sides, I have, during the last two years, used 150 injections. In that case a year's treatment with the ordinary methods was so much time wasted, on ac-

count of the extremely irritable condition of the stomach. I began with corrosive sublimate, and after the third injection of one-sixth of a grain the eruption began to recede, and has long since entirely disappeared, the treatment being still kept up for its general eutrophic influence.

In another case of papular eruption of the face which is still under observation, I have given fifteen injections, two being administered each week. Within one week of the beginning of the treatment the patient was able to discard her veil, which she had worn up to that time.

Syphilis is not the only disease in which such injections are appropriate. I believe that erysipelas is a disease in which germicidal injections are eminently useful. It has been demonstrated that erysipelas is due to the presence of a micrococcus in the lymphatic vessels of the skin, and treatment based upon the view that erysipelas was a local parasitic disease was first adopted by Hueter, who employed subcutaneous injections of a two per cent. solution of carbolic acid. His success was not very striking. An attempt was made to improve this method by Dr. Kühnast, of Friedburg, who treated three cases, and concluded that multiple scarification and the rubbing in of a five per cent. solution of carbolic acid, was the best treatment yet devised. This plan is open to serious objections, so serious that it cannot come into general use. The application has to be made under ether, and, on account of the danger of scarring, is not applicable to the face, the most common seat of erysipelas. I have treated five cases of erysipelas with the injection of bicyanide of mercury, one-eighth of a grain at each injection, and am convinced that this is a valuable method of treatment. One case was certainly rapidly aborted by one injection.

The formula which I have employed is :

Bicyanide of mercury	grs. ij.
Hydrochlorate of cocaine	grs. iv.
Water	℥iv.

The cocaine in this solution renders the injecting comparatively painless, and on this account I prefer the bicyanide to the corrosive chloride, with which cocaine is incompatible.

Fifteen minims of this solution, containing one-eighth of a grain of the bicyanide and one-fourth of a grain of cocaine, are used at each injection. I have seen no constitutional symptoms from this quantity of cocaine, with the exception of slight dizziness and some pallor, both of which I attribute to the cocaine. The idea of employing these injections in syphilis was suggested to me by Dr. Van Harlingen, but, so far as I know, the bicyanide has never before been used in erysipelas.

Dr. Wharton Sinkler said: Several years ago, I was treating a case of lateral sclerosis of syphilitic origin. At the suggestion of Dr. S. Weir Mitchell, I made a number of injections of corrosive sublimate, and the patient rapidly improved. Several years later he had a relapse. I again resorted to the injections of corrosive sublimate, but without benefit. The injections caused considerable inconvenience. There were no abscesses, but large masses of indurated tissue were formed, which were painful and lasted for some time; even two years later the lumps could be felt.

Dr. John Ashhurst, Jr., said: I have no personal experience with the use of hypodermatic injections in the treatment of syphilis, because I have not found them necessary. I think that in the large majority of cases, all that can be gained by the method suggested can be accomplished by other means, such as inunction, the use of green iodide of mercury, which is the drug I prefer in the early stages, or some form of the mixed treatment, especially that in which the biniodide is used, either in the form of corrosive chloride with iodide of potassium, or in the form of the French preparation, the "sirop Gibert," which is in some cases better borne than any other. The conclusion of those who have had a large experience in the treatment of syphilis is, that hypodermatic injections should be reserved for severe and rebellious cases. I

think that Dr. Wilson has hardly given sufficient credit to some of the early writers on this subject. Calomel appears to have been used hypodermatically in Italy more than twenty years ago, and both this and the more soluble mercurial salts have been experimented with by surgeons for many years, but in almost all cases have been eventually abandoned.

I should like to say one word with reference to a side issue which has been introduced, and that is, the treatment of erysipelas. Velpeau said that erysipelas was, as regards any particular part, a self-limited disease. He taught his pupils never to forget that uncomplicated erysipelas lasted in any part but from four to six days, and would disappear at the end of that time, no matter what treatment was employed. If the patient is surrounded by other erysipelatous patients, or if there is a condition of the constitution which predisposes to a spread of the disease, other parts may be involved, and the affection may thus continue many weeks; but in any particular part the disease is self-limited. This clinical fact I have pointed out over and over again to my classes, and I think that it is one with which most surgeons are familiar; it accounts for the great number of remedies which are employed with success in the treatment of erysipelas. I doubt whether there is any means of aborting erysipelas; the disease comes to an end when its time is up, and the particular remedy which has been administered receives the credit of the cure.

Dr. Wilson said: I fear that I did not make myself entirely clear in reading my paper. I referred entirely to the intramuscular injection of the insoluble preparations, which, prior to the publication of Neisser's paper, had been but little practised. It had been employed by Scarenzio, of Italy, in one case of diphtheria. I was aware that corrosive sublimate had been tried by various observers, and generally given up. Corrosive injections have been abandoned for two reasons. In the first place, as Dr. Henry said, they are painful, and, in the second place, the injection of a soluble salt of mercury violates one of the rules for the treatment of syphilis which has been

dwelt upon by Hutchinson, namely, that in syphilis the best results follow the use of mercurial preparations in small and frequently repeated doses. The hypodermatic injection of a soluble salt delivers the whole dose into the blood at once. On the other hand, the deep injection of an insoluble salt into the coarse muscles of the gluteal region exposes the salt to the action of the alkaline fluids of the tissues, which gradually convert it into the double chloride of mercury and sodium. It is this gradual conversion which leads to the efficient action of the drug.

This method has yielded brilliant results in certain stubborn cases where other methods of employing mercury have been used without benefit. If it is useful in the stubborn cases, it would probably be equally advantageous in the milder cases, yielding prompt and permanent results. This method enables us to determine the dose employed with greater exactitude than when the drug is used by the mouth. Under the latter mode of administration, it is often impossible on account of the disturbances of the digestive apparatus to form any idea of the quantity of mercury taken into the organism.

A STUDY OF THE ARTERIES AND VEINS IN BRIGHT'S DISEASE.

By

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[Read June 6, 1888.]

For some time past my clinical observations made annually in the wards of a large general hospital have led me to feel how unsatisfactory is our present understanding of the cause of many forms of heart disease, and of the mode of origin of Bright's disease, and at the same time how difficult it is to arrive at a satisfactory understanding of a case in which these two apparently far apart diseases are, as so commonly happens, coexistent. The intimate relation of disease of the two organs is so well known that for some years medical literature has been filled with various theories to explain how the one is dependent upon or caused by the other. As a result of the observations of Bright, it soon became well known that hypertrophy of the heart—and it was said of the left ventricle in particular—was very commonly associated with disease of the kidney; and naturally enough, it was thought, as the clinical history of such cases demonstrated the existence of kidney disease long before that of the heart became known, and often the heart disease was not suspected at all before the autopsy was

made, that the heart disease was entirely dependent upon, and caused by, that of the kidney, and complicated theories were brought forward to explain how the train was set in motion, and the various steps from its inception to its final development. Soon clinical medicine demonstrated that in many cases in which the coexistence of heart and kidney disease was undeniable, the history occasionally proved beyond peradventure that heart disease had existed before there was any suspicion, much less evidence, of disorder of the kidney. New theories were required to explain this condition, and they were soon found, principally in the results of congestion of the internal organs, and of the kidneys in particular it was assumed, which was a necessary result of disordered action of the heart. Another step was the observation that the two organs—heart and kidney—are connected by an immense vascular highway, the arterial system, which was found in many instances to partake in the disease; for atheroma of the arteries, more or less extensive, is a common accompaniment of combined heart and kidney disease. Parenthetically, it may be observed here that it is curious that comparatively little is to be found in medical literature in regard to the state of the venous system, either in the form of study of its physical condition, or of theory in regard to what might be expected to happen to the veins, though the rest of the subject has been from many points of view somewhat overloaded with theories. This is strange, when it is recollected that the venous highway connecting the two organs is just as large and fully as important as the arterial. The observations of Dr. George Johnson of the hypertrophy of the muscular coat of the arteries of the kidney, and later, of the same

hypertrophy in various other tissues and organs in cases of red granular contracted kidney, and those of Virchow of the state of the arteries in amyloid disease, constitute important landmarks in the development of our knowledge of the whole subject, and this though there has been, and is, great difference of opinion in regard to the interpretation of the various facts observed. The paper of Gull and Sutton upon the so-called arterio-capillary fibrosis was the first systematic attempt to show that many cases which had previously been called Bright's disease of the kidney were, in truth, due solely to changes which had their origin in the arteries and capillaries, and in the connective tissue in which they lie. This was a bold step in advance, and has done much toward leading to a clearer comprehension of the complaint by ridding the minds of pathologists of the idea that the disease was Bright's disease of the *kidney*, and that in that organ alone must they dare to seek for the original source of the pathological train. The observations of Gull and Sutton, though of great value in thus clearing the atmosphere of this old doctrine, have not been borne out in other respects by subsequent and more extended observations. Their assertion that the origin of the vascular changes is to be looked for in the adventitia of the arteries and in the capillaries, can hardly be considered to have been substantiated. With regard to capillaries, our present means for their study are not satisfactory, and little has been even asserted, up to the present time, of their diseases, except that in some cases it has been considered that the walls of the Malpighian tufts of the kidneys were thickened, and again, that there was in various organs increase of the perivascular connective tissue.

So far as the first assertion is concerned—that the walls of the Malpighian capillaries are thickened—it cannot be considered as having been proved, though it is exceedingly likely; and for the increase of connective tissue, it yet remains to be demonstrated that this is a part of, or even due to, the capillaries, with regard to the real physical condition of the walls of which we are still somewhat in ignorance. No attempt to study the condition of the capillaries in dead tissues, further than to trace their course, has as yet yielded any conclusive results. Nor has it by any means been demonstrated that the changes so extensively found in the arteries and arterioles have their origin in the adventitia.

The present state of knowledge of the complaint seems to be about as follows: It has long been known that in cases of albuminuria certain physical changes take place in the kidney, and that very commonly there is enlargement of the heart; and further, often there is atheroma of the larger arteries, which is more or less extensive as the case may be. It has, besides, been demonstrated that other changes, chiefly of a degenerative or atrophic nature, are found in many of the various organs and tissues of the body—namely, disease of the cerebral arteries and of the arteries and substance of the spinal cord,[1] emphysema and slow inflammatory processes in the lungs, calcareous and allied forms of disease of the heart valves, degenerations of the coronary arteries, and fibroid change of the muscular substance, and various forms of disease of the liver and spleen. Such being the case, quite a number of the medical minds that have bestowed attention upon the subject have been struck

[1] Gull and Sutton: On Changes in the Spinal Cord and its Vessels in Arterio-capillary Fibrosis. Trans. Path. Soc., London, vol. xxviii., 1877.

with the idea, and have enunciated the belief that this hydra-headed disease, or collection of related diseases, as the event may prove to be, had its origin in the arteries or capillaries, or both, though no one has as yet shown what the mode of origin is; Dr. Johnson, and those of his school, believing it to be one of the so-called blood-diseases which produces its first physical change in the secreting cells of the kidney, while Gull and Sutton, and their following, equally strenuously uphold the opinion that the disease has its origin in the adventitia of the arterioles and in the capillaries and perivascular connective tissue.

The utter inadequacy of a diagnosis of valvular disease of the heart, or Bright's disease of the kidney, in cases of this nature, as at all descriptive of the real conditions, has pushed itself upon me so forcibly of late years that I have been in the habit of saying, and recording in my clinical histories, that these cases were of vascular origin. Sometimes it seems like the natural result of the advance of years, the machinery wearing out simply because it is too old; or, again, it is as if premature old age came upon the patient, or perhaps he is worn out by dissipation, or because he has earned his livelihood by some physical labor so severe that it necessarily speedily exhausts his vital forces and produces the physical disorganization. The absurdity of the old practice of endeavoring to elicit a history of rheumatism, and then, if the slightest account of joint pains during the past life could be had, of attributing the disease to that, I have long looked upon as the weakest explanation. It is now well known that rheumatism, instead of being, as was formerly thought, almost the sole cause of valvular disease of the heart, is but one of many, all of

which are equally capable of producing it. Dr. Allbutt[1] long ago, in an able article, expressed his opinion that, in the large manufacturing town in England in which he lived, heart diseases in hospital practice were much more common among young men as the result of over-exertion of the body than of acute rheumatism.

As clinical study has seemed to do little for me in the direction of showing what is the original physical change or pathological basis of the disease, but has merely taught me to be able to predict, with a good deal of accuracy, that, in addition to the well-known lesions in the heart and kidneys, other very widely diffused changes will be found if sought for after death, I have turned from the wards to the post-mortem room in the hope that thus some light might be shed upon the subject. In this way I have been led to the observation of facts which, I trust, may be worthy of the consideration of the profession. It is with a profound sense of the wisdom of Sir James Paget's observation,[2] that "medicine and surgery are eminently a science of observation; deductions from facts are always unsafe; I believe that they have done far more harm than good; and, for the most part, when sufficient facts have been collected and arranged, the general conclusions that may justly be drawn from them are nearly manifest," that I attempt to describe what I have seen. If I should be led into making deductions, and few men can resist the inclination, which seems a natural one to thinking beings, the already quoted wise saying must be remembered, and a sharp line drawn between that which is a

[1] The Effects of Overwork and Strain on the Heart and Great Bloodvessels. St. George's Hospital Reports, v. p. 23.

[2] Address at Owen's College. Lancet, October 15, 1887.

result of observation and therefore fact, and what is merely theory or deduction.

The first thing that strikes one who reflects upon this combination of heart and kidney disease is the intimate connection there is between the two organs by the vascular system, the arteries and veins, and that if the disease begins in one organ and extends to the other, this must be the channel of communication; or that perhaps it does not originate in either, but in the blood-vessels, and secondarily extends to the organs. This latter preconception is rendered still more probable when it is remembered that degenerative changes parallel to those found in the heart and kidneys exist in many other organs and tissues, and it therefore becomes much more easy to believe that the vascular change is the cause and not the consequence. In pathological investigation, therefore, with a view to further elucidation in regard to the original cause, my mind has been occupied with the preconceived idea that the search must be prosecuted by study of the physical conditions of the arteries and veins, and perhaps the capillaries. This statement is made with the knowledge that wherever bloodvessels go they are accompanied by nerves, and that it is possible, and from a purely theoretical standpoint as likely, that the pathological lesions under discussion originate in the nerves as in the bloodvessels. Drs. Da Costa and Longstreth[1] have asserted that in Bright's disease there is a constant lesion of the renal nerve plexus, and have expressed their opinion that this lesion is the cause of the kidney disease, and have fur-

[1] Da Costa and Longstreth: Researches on the State of the Ganglionic Centres in Bright's Disease. American Journal of the Medical Sciences, July, 1880.

ther suggested that a similar lesion may exist in other ganglia producing parallel effects, as, for instance, in the cardiac plexus, causing the hypertrophy of the heart. Though this is of course an explanation which may be correct, it has been by no means proved, and even if extended investigation should show nerve-lesions to be as constant a feature as are the bloodvessel changes, it remains to be discovered which, if either, is the real original cause, for upon purely hypothetical grounds the two are perhaps equally acceptable.[1]

In making somewhat extended post-mortem investigations the lesion I have found to be most constant and most extensively distributed throughout the tissues is disease of the arteries and arterioles, a condition in which, so far as my observations have carried me up to the present time, though I confess that the study has not as yet been exhaustive, the veins seem to participate. In regard to the condition of the capillaries I have nothing to say, for, as already stated, there is no known satisfactory method of studying their physical condition in dead tissues. It is a commonly recognized fact that in cases of the so-called Bright's disease there is ordinarily present a greater or less amount of atheroma of the larger arteries; and Johnson upon the one hand, and Gull and Sutton on the other, and when these names are mentioned it must be understood that all other observers who have either preceded or followed them in the same lines of investigation are included,

[1] Since the above was written Dr. Da Costa has published another paper upon this subject, giving the results of microscopic examination of the cardiac ganglia in cases of Bright's disease, and announcing that extensive organic changes were found. The Middleton Goldsmith Lecture on the Relation of the Diseases of the Kidney, especially the Bright's Diseases, to Diseases of the Heart. Medical News, May 5, 1888.

have made extensive observations in regard to the state of the minute arteries in many of the organs and tissues of the body. Their conclusions have been quite different from those reached by me, though in the course of my investigations I have fallen upon appearances similar to those they have described. I have made sections from the brain, spinal cord, lungs, heart, liver, spleen, kidneys, and of various of the larger arteries and veins, and in all of them—except the spinal cord, and with regard to its condition my examinations have not been sufficiently numerous to be conclusive—have found quite constantly present an irregular overgrowth and thickening of the intima of the arterioles. This thickening varies very much in its anatomical characters and its extent, and often when it is present in high degree there is involvement of the other coatings, though ordinarily they have undergone no change. The morbid appearances will be better understood from an examination of the plates than would be possible from any written description. The condition appears to be nothing but that which is described in text-books of pathology as the various forms and stages of atheromatous change, but observers do not seem to have connected its existence with this disease further than to note that it was commonly present in the larger arteries. The appearances found differ much in accordance with the size of the vessel in which they are observed, and in different organs. In larger-sized vessels the more commonly understood atheromatous changes will most usually be found—misshapen vessels, calcareous deposits, loss of substance of intima, thickened patches upon the inner surface (these being often so extensive as to cause great obstruction to the blood-current, sometimes

the lumen of the vessel being a mere chink at one side; see plate, Fig. 5), and where the condition has progressed to its full development, more or less destruction or alteration of the entire thickness of the walls. In smaller ones the changes are most commonly confined to increased thickness of the intima, which is not usually so irregular in degree at different portions of the circle as is the case in large arteries, though it is seldom absolutely uniform. The intima in such vessels, when examined in cross-section, often has a thickness which will be half as great as, or even equal to, that of the muscular coat, but it may vary to almost any extent. This tissue, when examined under the microscope, appears to be composed of fibrous material, the fibres of which, when the vessel is viewed in cross-section, appear to be circular, and in longitudinal sections to run lengthwise; there are, therefore, probably abundant fibres running in all directions, thus giving the tissues considerable strength. Contrary to what is commonly stated, I have usually found this morbid tissue to contain here and there numerous nuclear elements. In the larger vessels in particular, and where the patches of atheromatous thickening are large, they are often composed of a well-organized tissue containing numerous cells, which in their appearance and arrangement resemble granulation tissue, seeming disposed to arrange themselves in nests, as is common in young and rapidly growing tissues.

The well-organized cellular outgrowth of the intima in these cases is identical with that which has been most frequently described as syphilitic endarteritis, and yet I have seen it in a number of cases in which there was neither a history of syphilis nor reason to suspect the existence of that disease. Examination of the endo-

cardium and valves of the left heart often shows a condition precisely parallel to, and seemingly a part of, the same process, the evidences of which exist so extensively in the arteries. It seems positive that the endocardial and endarterial changes are but part of the same disease, and that this is the cause of the valvular changes which so frequently arise, complicating the trouble, and, when they exist, much hastening the inevitable fatal result. In examining the thickened patches of endocardium, and in sections of aortic valve flaps, thickened and distorted by the disease, there were found the same nest-like arrangements of cells described as existing in the intima of the arteries.

While the above-described conditions are those I have usually seen as a result of examination of the arteries, I have not, as a common thing, found the increased thickness of the muscular coat, which is described by Johnson, and called by him a hypertrophy, to be present in such degree as to render its existence undoubted. Arteries may often be found in which it could be said that the middle coat was unduly thick, and again others, in regard to the state of which there might be dispute, but in most instances I have failed to find an increase so great that its existence could be considered to be beyond doubt. It is a much easier matter to be sure that the appearances described of the intima are morbid; for, in the natural state, in small vessels certainly, it constitutes but a very thin layer, and besides, when it is seen to be many times thicker, as happens in many instances, upon one side of a transverse section of an artery than upon the other, there cannot be a shadow of doubt that such an appearance is pathological. This is very different from what is found in regard to the muscular coat, which,

if at all thickened by disease, is uniformly so, and there is, therefore, nothing to contrast it with, and its state can be merely estimated as a matter of judgment. It is curious that in one case in which I made many sections (case of J. K——) of different organs and vessels, the only artery in which there was undoubted thickening of the muscular layer was one of the primary branches of the renal. In this vessel the intima was thickened to a slight degree, but much more so at some parts of the circle than at others, and the plicated membrane very distinctly visible around the entire circuit; the muscular coat, however, which was probably of twice the ordinary thickness in a vessel of such size, did not present the appearances which could be called those of true hypertrophy; for, although the muscle bands and nuclei were present and numerous, there were also visible very many other cells which were exactly like those described as so commonly found in the overgrown intima. These cells were, so to speak, wedged in between the muscle elements, and many of them were undergoing pigmentary degeneration. Sections of the abdominal aorta in this case, and of the minute arterioles in the renal substance itself, did not show any indisputable increase of the muscular coat, though there was in both overgrowth of the intima. To anyone who would wish to advocate Dr. Johnson's view, that increased thickness of the muscular layer is a true hypertrophy, and that it increases what he calls the "stop-cock" power of the arterioles, does it not seem strange that the only artery that showed undoubted increased thickness of the middle layer in this case should, in that very layer, present the marked evidences of a degenerative process, and that the vessel affected should be a very large one, to which, ordinarily,

is attributed elasticity and not much contractility, while the minute arterioles of the kidney, the very citadel of the supposed condition, should present none of it, and all the vessels in the neighborhood should have plainly thickened intimas?

Fig. 9 represents two views of a minute artery removed from a kidney under a dissecting microscope. The upper one is intended to produce the same effect as Johnson's (*Medical Lectures and Essays*, by George Johnson, 1887) picture, from the appearance of which he makes his assertion of the existence of hypertrophy of the muscular coat. The vessel was carefully dissected out, then split open with scissors, and mounted with the inner side up, thus showing half of the internal surface of the vessel and the thickness of its walls at the cut edges. No fibrous coat is distinguishable, and the same holds good in Johnson's figures, but the muscular coat and intima are very well shown. Whether the muscular coat is increased or not I think might well be disputed, as this layer in the walls of an artery of such size is always a marked feature in a picture; that the intima is increased in amount, and, as represented in the picture, irregularly so, there can be no doubt, though it might be said that this is due to the crude method of preparing the object, to dissect it out and then cut it with scissors. That such is not the case, however, and that the intima is actually thickened, and irregularly so, is made very plain by the other picture. This is a bit of the same artery, and the section was prepared by cutting off from the end, before it was split open, as thin a section as could be made with a pair of scissors, and it very well shows the thickened intima lying within the plicated membrane, which latter is not distinguishable at

all in the longitudinal section. To my mind it becomes evident from the contrast presented in these two pictures that the change of the intima is a much more positive and unmistakable one, and one which, in the nature of things, is capable of producing quite as grave effects as that of the muscular coat, upon the existence of which in this vessel doubt may be cast; a change also which, even if in other vessels its existence is undeniable, is accompanied by degenerative processes so extensive as to render its proper classification as a true hypertrophy uncertain.

So far as the "fibrosis and hyaline-fibroid" condition, described by Gull and Sutton, is concerned, I have failed to discover it in its full development. They declare their belief, and try to prove, that the vascular changes have their origin in the fibrous coat, and describe a high degree of thickening of the adventitia as being usually present. There can be no doubt that there is great increase of fibrous tissue, and it is found more extensively developed around the bloodvessels, the place in which connective tissue exists more abundantly than elsewhere in all organs; but its appearances are more those of a general increase of perivascular connective tissue than of the adventitia of arterioles alone. And for the matter of that, how is it possible to decide, in any section examined with the microscope, where the fibrous material lying outside the muscular coat of an artery ceases to be adventitia and becomes perivascular connective tissue? The two structures are identical and shade into each other without any defined boundary. Nothing that answered the description of hyaline-fibroid change of arterioles has come under my notice except certain appearances presented by the vessels in sections

of the spinal cord. In the thoracic and abdominal viscera I have failed to find it, and cannot comprehend why this should be, unless it is, as stated by Johnson (*Medico-Chirurgical Transactions,* vol. lvi.), that their methods were faulty, and that the use of glycerine and camphor in mounting produced the appearance described. In the spinal cord I have found arteries with walls that looked entirely structureless except for a few nuclei lying at the edge of the lumen of the vessel, and answered exactly to the appearances described and figured by Gull and Sutton (*London Path. Soc. Trans.*, loc. cit.). It might be well to mention here, as a matter of interest, though I have no explanation to offer, and do not know if it had any bearing upon the condition, that in this same case, which was one of marked Bright's disease, the olivary body, and nucleus dentatus within it upon the right side, was much larger than the left, though no morbid condition of the tissue itself could be discovered upon either side.

In two cases in which I made an extensive microscopic examination of the tissues, and they are the two from which the vessels represented in the plates were taken, I found morbid changes in the veins as well as the arteries. Atheroma of veins so extensive as that of the femoral, which is shown in Figs. 7 and 8, is not usually described as being common, though the occasional occurrence of the disease in veins is sufficiently well known. After the section from which the picture is made was prepared, it was found impossible to determine with certainty, from the microscopic appearances alone, that the larger vessel of the two was really a vein, so great is the thickening of the intima and fibrous coats, and it was only by a careful examination of the

piece of tissue from which the section was cut, and the discovery of a well-marked valve in the vein, that an absolute conclusion was reached. The two vessels, which were removed from the upper part of the thigh together, were found to be rigid, like bony tubes, and it was only after decalcification that sections of them could be cut. The process of disease in this vein appears to have been exactly the same as takes place in arteries, some thickening of all the coats, perhaps, for when considering the state of the muscular layer it must be remembered how thin it is in a natural condition in veins, and of the intima in particular. It is a noticeable fact that the thickening of the intima varies very much at different parts of the circle of the vessel, in this respect being precisely parallel to what has already been so much emphasized as occurring in arteries. The structure of the intima also appears to be similar in character to that found in arteries. How the two inner coats became loosened from the fibrous one, as appears in the plate, cannot of course be known; but it may be that the breakage occurred in removing the vessels from their position in the thigh, for so rigid were they that it required the exercise of some force to remove them.

Fig. 12 represents a portion of a vein lying in the adipose tissue covering the front of the heart, and presents a condition of which I have never seen any description. In most of it the walls are very thin and the tissue of a very loose texture, but in the intima there are two spots opposite each other in which marked cellular outgrowth has taken place and the cells have in the most distinct way arranged themselves in nests precisely like those described as existing in the arterial system. When this is examined with a higher power

the arrangement of the cells can be still more plainly distinguished.

In most of the veins I have examined in this disease, what has struck me most forcibly in them has been the tenuity of their walls and the looseness of texture of the material of which they were formed. This can be seen to some extent with the naked eye as well as by the aid of the microscope. I have found that it is not uncommon, if a vein is cut open, spread out flat, and then held up to a strong light, for the walls to vary much in thickness at different parts, and in some places to be exceedingly thin. In the case of J. K——, sections were made transversely across a large branch of the renal vein, and the walls were found to be so thin that it seemed astonishing how it could have been at all an adequate container of blood.

In regard to the structural condition of the capillaries, for reasons already mentioned I do not even pretend to an opinion.

It may perhaps now be permissible to attempt to draw some contrast of the general features of the two cases from which my illustrations were taken. That of J. K—— was made the subject of a short paper read before the Philadelphia Pathological Society in the early part of 1888, and published in the *American Journal of the Medical Sciences* for June of the same year, and it will therefore not be well to do more than sketch the outlines of the case again. It was one of typical aortic regurgitation in a man fifty-four years of age. The heart disease came on late in life and without the occurrence of any attack of rheumatism more than some vague joint pains, which never confined him to bed, and he died gradually of heart failure, without dropsy or

anything to point to involvement of the kidneys, except that when he first came under notice there was a trace of albumen in the urine, without casts, which, however, soon disappeared never to return. After death there were found brown atrophy of the heart, fibroid degeneration, thickening of the endocardium and of the aortic valves, and in both of these the existence of the peculiar cell-growth which has been described. The arteries and veins of the heart presented appearances already mentioned (Figs. 11 and 12). The lungs gave evidence of some catarrhal inflammation and their arteries of thickening of the intima. The liver-cells were much degenerated, and the arteries as in the other organs. The kidneys exhibited evidence of parenchymatous disease, there were cast in the tubules, and the arteries showed the same change as found in vessels elsewhere (Figs. 9 and 10). The condition of the renal artery and vein, and of the abdominal aorta, vena cava, and a small branch of the cava have already been mentioned. There were large inflammatory bands in one of the iliac veins, causing obstruction in that vessel.

The case of J. C—— presented in many respects a contrast. He was fifty-one years of age, and had suffered with some shortness of breath and palpitation for three years. When admitted to the hospital, about two months before his death, there was great dyspnœa, amounting to orthopnœa, and of this he never got rid. Dropsy and difficulty of breathing increased, and his sufferings became worse and worse; nothing seeming to afford him any relief until, finally, he died, having suffered what was almost agony. The conditions were in all respects those usually regarded as typical of Bright's disease, except that no casts were found in the urine,

though albumen was always present. Post-mortem examination showed that the heart and all its openings were much enlarged, there was extensive brown atrophy of the muscular substance and calcareous deposit in the base of the aorta and valve-flaps. The minute veins exhibited irregular thickening of the intima, and the condition of one of the arterial branches is shown in Fig. 5. The pleura was thickened and the lungs adherent; there was emphysema and some catarrhal infiltration, and the condition of a minute arteriole is represented in Fig. 3. The liver was in a state of fatty and granular degeneration, and the hepatic arteries and portal veins were much thickened and diseased. There had been inflammation around the spleen, binding it to the surrounding organs, and on section it showed marked fibrosis, and the arteries were much thickened, the intima markedly so. There was parenchymatous disease of the kidneys, the capsules were thickened, and there were infarctions, and the arteries diseased (Fig. 4). The radial artery and femoral artery and vein were atheromatous and calcified (Figs. 6, 7, and 8). The abdominal aorta presented distinct irregular thickening of its intima. In the spinal cord there seemed to be some degeneration of the nerve-fibres, particularly of the peripheral nerves, and the arterioles presented the characters described and figured by Gull and Sutton (*London Path. Soc. Trans.*, loc. cit.) as hyaline-fibroid degeneration. The walls were composed of a material which under the microscope appeared structureless, except that a few nuclei lay at the inner edge. In the medulla oblongata, as already mentioned, the right olivary body and its contained nucleus dentatus was much larger than the left. The large artery running

along the front and that upon the posterior surface both presented in marked degree the irregular thickening of the intima. Figs. 1 and 2 show the condition of the intima of one of the middle cerebral arteries. Sections of this vessel higher up, or rather of its branches after it had divided into three, exhibited irregularly thickened intima in two of them, while the third presented an appearance quite natural.

In these two cases the mode of death and the picture presented by the history of the last few years of life were as dissimilar as could well be, though in many respects the pathological lesions found were singularly parallel. Though in the first case the man died what would commonly be considered a typical heart death, and in the second an equally typical kidney death, and there should have been, reasoning from analogy, a great difference in the pathological lesions, such was not the case. It would be difficult, if not impossible, for anyone, from a study of the pathological lesions alone in these two cases, to say that the modes of death would have been in anywise different. The most important of these lesions, perhaps, were the changes in the heart and kidneys, and in respect of these, the two cases were not materially unlike, and in both were found besides extensive changes in the arterial and venous systems, which, though presenting many points of difference, were yet only varying features of what seems to be primarily the same disease.

The disease seems to be very widespread in its early effects even, and may first reveal itself clinically by a cough if it takes possession first of the lungs, or by the symptoms of apoplexy if the brain arteries are the earliest to suffer injury, or by epistaxis perhaps, which has

always seemed to me to betoken just as positively a physical change of the arterioles of the nares, though of this there is no pathological evidence as yet, as does the apoplexy show that the brain arteries are diseased. Often have I found, by the most careful inquiry into the clinical history in cases of typical Bright's disease, that the first symptom with which the patient has suffered has been cough, and it is a fact well known how often persons dying of apoplexy are found to have had Bright's disease, and it is equally well known how often epistaxis is the first warning given of the existence of kidney trouble. There is, however, no reason, except that Bright first drew attention to the existence of changes in the kidneys (and this is no reason at all), to suppose that the diversified lesions were all caused by the changes in either the secreting substance or in the arteries of the kidneys.

The fact that cerebral hemorrhage and epistaxis are such common accompaniments or symptoms of chronic Bright's disease seems to me the strongest proof that it should not properly be considered to be one of the kidney, for there exists at the present time no evidence to show that the kidney disease which sometimes, but not always, exists in such cases, originated before the bloodvessel change which was their direct cause, nor is there even a very plausible theory to strengthen such a hypothesis.

In conclusion, it may be stated that my desire has been to make clear, by language and pictures, the view that in the so-called chronic Bright's disease, we have to deal with one which is wide-spread in its effects; that the most characteristic and probably most important changes, so far as at present known, are those of the

intima of the arteries, in which probably the veins always participate; that changes in the muscular coat and adventitia, though often present, are by no means so important in their effects, and probably are secondary to those of the intima; that the process seems to be coextensive with, and probably is a part of, the change in the large arteries which is so common and so well known as atheroma; and finally, that it seems likely, in the absence of proof that changes in the nerve-substance are a necessary accompaniment, or even if such were proved to be the case, the lack of knowledge that they antedated the disease of the bloodvessels, that the earliest of the now known pathological lesions to make its appearance is the change in the intima of the bloodvessels.

My paper must not be closed without an acknowledgment of my great indebtedness to Dr. B. A. Randall for the beautiful illustrations I have been enabled, through his skill, to present.

FIG. 1.

FIG. 2.

Fig. 3.

Fig. 4.

Fig. 5.

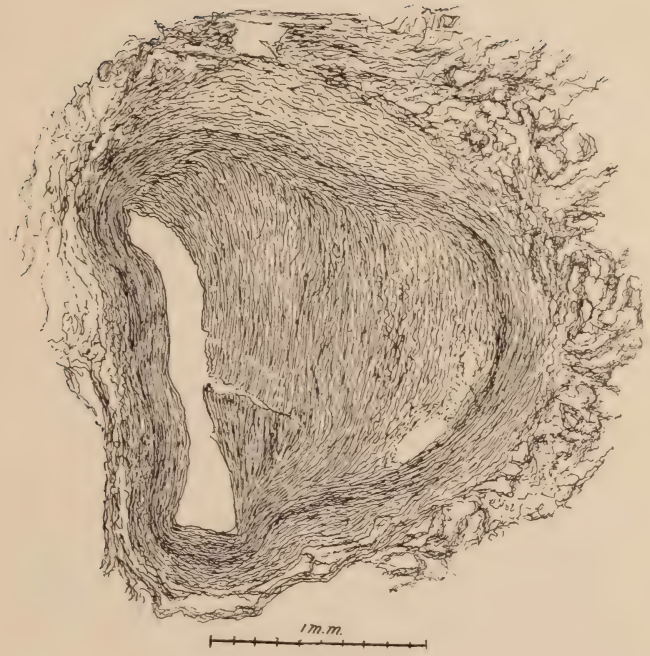

Fig. 6.

Fig. 7.

Fig. 8.

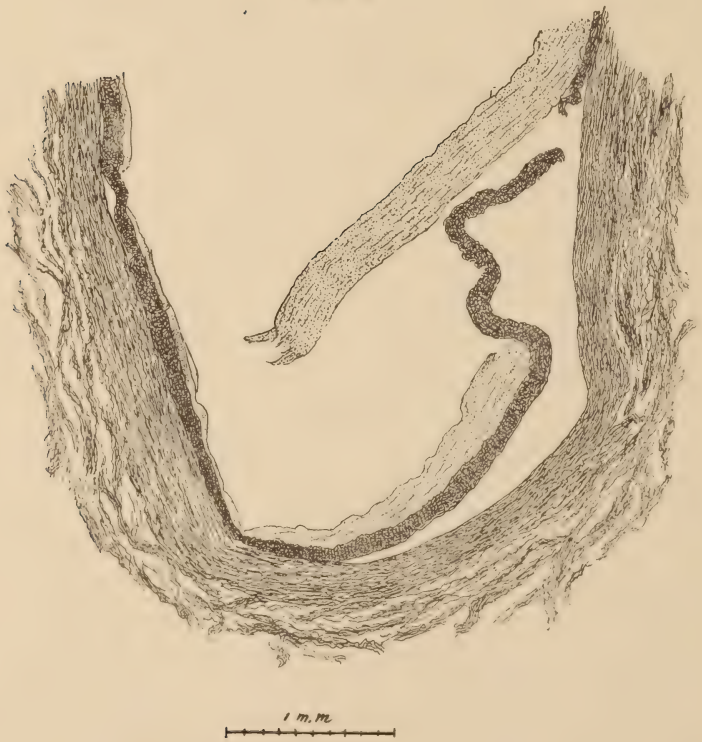

FIG. 9.

FIG. 10.

Fig. 11.

Fig. 12.

EXPLANATION OF PLATES.

FIG. 1.—Case of J. C——. Middle cerebral artery, showing irregular outgrowth of intima. The accompanying vessels are somewhat enlarged; the adventitia and muscular coats are normal. The plicated membrane shows very distinctly around the entire circle. The intima is seen within the plicated membrane, and is thickened in the entire circuit; but at one side, and occupying about one-third of the circumference, the thickness is very great. At one portion of this mass there are numerous blood-corpuscles, entangled in the tissue, while at another there is distinct cellular structure. × 20 diameters.

FIG. 2.—A portion of the same artery as Fig. 1, and showing the cell-growth and entangled blood-corpuscles, and that the general character of the structure of the most thickened portion of the intima is a fibrous material. The open spaces are probably due to tearing of the tissue in mounting. × 35 diameters.

FIG. 3.—Case of J. C——. Minute arteriole from lung, showing great thickening of the intima, which contains a few scattered cells, though most of it consists of a homogeneous, structureless-looking material, quite different from the appearances seen in Figs. 1 and 2. The muscular coat and adventitia cannot be very satisfactorily differentiated, but they do not appear to be at all thickened. The plicated membrane is a marked feature of the picture. × 220 diameters.

FIG. 4.—Case of J. C——. Minute arteriole from the kidney, showing great thickening of the intima, which is almost structureless, containing only a few scattered cells; there being in addition merely a few fibres running around the circle of the vessel. × 60 diameters.

FIG. 5.—Case of J. C——. Branch of coronary artery from anterior surface of heart, showing almost the entire lumen of the vessel filled with an outgrowth, the opening being a mere chink. When seen with the amplifying power used in making the picture, this morbid material has, as represented, merely a fibrous appearance; more magnified, the deposit is seen to contain a great many cells and to be a well-organized fibrous growth. × 28 diameters.

FIG. 6.—Case of J. C——. Radial with two accompanying arteries. It was so much hardened by mineral deposit that it had to be decalcified before sections could be cut. The differentiation of fibrous and muscular coats does not show well, perhaps owing to the soaking in acid to remove the salts, but

more likely to the extensive atheromatous degeneration. The plicated membrane is a marked feature around the entire circuit, and the intima within it is much thickened. The atheromatous degeneration has extended deeply into the muscular layer. × 15 diameters.

Fig. 7.—Case of J. C——. Femoral artery and vein. Both vessels were converted into rigid bony tubes by calcareous deposit and had to be treated with acid for its removal before sections could be cut. The artery shows ordinary atheromatous changes, the intima being irregularly thickened and spots of degeneration existing in the muscular coat. The vein shows an intima very greatly and irregularly thickened, At one place this coat and the muscular layer are broken loose from the adventitia. This probably occurred in removing the vessels from the thigh, for they were so rigid and firmly fixed in their position that some violence was necessarily used in cutting and tearing them loose. × 5 diameters.

Fig. 8.—One-half of same vein as in Fig. 7, more highly magnified, and therefore better exhibiting the minute structure. × 22 diameters.

Fig. 9.—Case of J. K——. Views in longitudinal and transverse section of an artery from the kidney, which was removed under a dissecting microscope, and then split in half with scissors lengthwise, and mounted with the inner side upward in imitation of Johnson's picture (*Medical Lectures and Essays*, by George Johnson, 1887). There are visible the inner surface of the artery and the edge of the intima and muscular coats. The fibrous coat does not show at all, and this is the case in Johnson's figures also. The intima is thickened, and in various degrees at different areas; this might be said to be due to irregular cutting of the vessel, but is disproved by what is seen in the transverse section. The circular view is of the same vessel, but cut transversely with a pair of scissors. This shows marked thickening of the intima and its irregular distribution, and the plicated membrane is a marked feature of the picture, though not visible at all in the longitudinal section. The question whether the muscular layer was thickened in this vessel is one which might well be disputed, though there can be no doubt of the thickening of the intima and its difference in degree at different positions. × 68 diameters.

Fig. 10.—Case of J. K——. Minute arteriole from the kidney, showing marked irregular increased thickness of the intima. × 100 diameters.

Fig. 11.—Case of J. K——. Third descending branch of left coronary artery (runs down front of heart in or near interventricular septum), exhibiting, most beautifully, extensive atheromatous degeneration. In two positions there is slight imperfection in the mounting, the outer portions of the section being folded over. There was no calcareous matter deposited in this vessel. The fibrous and muscular coats exhibit no extensive changes, there being merely slight invasion of the latter by the degenerative processes, and

this is visible in the lower portions of the figure. The plicated membrane has been destroyed everywhere except in the portion of the artery figured at the right-hand side of the picture, and there it forms a marked boundary between the muscular coat and intima, which latter, throughout its entire area is most markedly and irregularly thickened. In the lower part of the picture, at the junction of the intima and muscular coats, atheromatous degeneration and softening is shown to have taken place, and extended into both the layers. The state of the intima of this vessel is typically characteristic of the diseased condition which it has been desired to describe and represent. $\times$ 12 diameters.

FIG. 12.—Case of J. K——. Of a vein and artery, contained in the adipose tissue, from the anterior surface of the heart, near the interventricular septum. The walls of the vein are generally thin and of loose texture, but there are two masses lying in the intima upon opposite sides of the vessel which are made up of tissue which evidently has a cell-like arrangement. More magnified, this is plainly seen to be composed of cells arranged in nests, and is precisely similar in structure to what is found in the intima of arteries, and in the endocardium and heart-valves. $\times$ 40 diameters.

NOTE.—These are from pen drawings by Dr. B. A. Randall, and the plates were made by photographic process, and reduced from the original size by about one-quarter to one-half.

[After the reading of the preceding paper:]

Dr. James Tyson said: I am naturally much interested in the subject of this paper. It appears to me that with respect to the bloodvessels, more particularly in the arteries, including those of the general system as well as of the kidneys, Dr. Meigs is largely correct. As to the changes in the intima, from an examination of a large number of preparations I would say that they are, in the main, inflammatory in their origin, resulting in thickening similar, but as a rule less in extent than in atheroma due to syphilis or to gout. Further, there is no doubt that these changes may extend to the middle coat. As Dr. Meigs very properly remarks, it is sometimes impossible to say whether the thickening of the muscular coat is due to hypertrophy of the muscular coat itself, or simply to the presence of products of inflammation. Dr. Johnson has given us very good drawings which would seem to show that there is true hypertrophy of the middle coat, and in the case of certain of my own preparations, too, I cannot avoid the conclusion that the muscular coat is hypertrophied in the true sense of the word.

I may have slightly misunderstood Dr. Meigs, but I should differ with him in some of the general applications which he has made of this condition in association with chronic Bright's disease. In my mind, it has a definite association with what we call contracted kidney. The causation of interstitial nephritis is more and more resolving itself into an irritative state of the blood from the presence of nitrogenous constituents, which by their irritation produce chronic endarteritis in the vessels of the kidney, and in those of the system at large. This has its most striking illustration in those cases of interstitial nephritis the result of gout. We know very well that in gout we have one of the most powerful causes of atheroma, which is simply the terminal stage of endarteritis, the fibrillar change and cellular hyperplasia, which Dr. Meigs has so well

described, preceding it. Between these evidences of irritation due to the poison of gout, and the results of slighter degrees of irritation which are scarcely appreciable, there is, of course, every intermediate degree. In a large number of cases of interstitial nephritis, so-called, there is an intermediate state of the blood which produces an intermediate irritation of the intima and intermediate pathological results. These results are also comparable to those of acute rheumatism, notwithstanding the fact that the degree of valvular change in interstitial nephritis is seldom very great. The results of rheumatism may, by the way, be quoted as a condition favoring this view. The poison of rheumatism acts also upon the vascular lining, but from some cause, rather upon the lining of the heart itself than of the bloodvessels; but it may cause inflammation in both.

With regard to the apparent hypertrophy of the left ventricle of the heart, I cannot quite agree with Dr. Meigs that a true muscular overgrowth is relatively infrequent, and that it is rather an invasion of the muscular coat with the products of inflammation. I think we must admit, in most cases, a true hypertrophy of muscle, which can only occur as the result of compensatory action, however brought about. This, too, must be the cause of any true hypertrophy of the muscular wall of the bloodvessel.

There is, undoubtedly, reason to believe that in interstitial nephritis the changes in the tubules of the kidney are secondary, that the tubules are gradually destroyed by the invasion of the overgrown connective tissue, which in this case does not confine itself to the inner lining, but extends to the adventitia, gradually destroying the tubules and substituting connective tissue.

These are the conditions in the cirrhotic kidney. On the other hand, we have cases of kidney disease beginning as parenchymatous inflammation, which are not so constantly associated with these systemic arterial changes.

The condition of arterio-capillary fibrosis described by Gull and Sutton, I have never seen. I have never seen anything

that looked like it. I am inclined to agree with Dr. Meigs, that this is the result of the mode of preparation. I believe their idea is, that the change begins in the adventitia and extends inward.

In further explanation of the hypertrophy of the left ventricle, I might add that the effect of atheroma is necessarily to produce either hypertrophy of the left ventricle or dilatation of the bloodvessels themselves. In consequence of the stiffening of the vessel, the effect of the elastic recoil, which is an important factor in the onward propulsion of the blood, is lost. The heart endeavors to make up this lack of propelling force and hypertrophies. We have in kidney disease less frequently dilatation of the bloodvessels, perhaps because the changes are not sufficiently advanced to permit this effect, while they have progressed enough to cause loss of the elastic recoil, and the heart in the attempt to make up this loss undergoes compensatory hypertrophy.

Dr. George C. Harlan said: In connection with this discussion, an illustration of the condition of the retinal bloodvessels sometimes found in Bright's disease may be of some interest. In some of these cases, one or more of the retinal vessels is converted into a dense white line. Comparatively few of these cases have been reported. The condition has been attributed to various causes, as embolism, ischæmia, thrombosis perivasculitis, and to opacities of the vessel wall itself. In the case from which this drawing was made, and which was reported two years ago to the American Ophthalmological Society, every retinal vessel, whether large or small, arterial or venous, appeared in the fundus entirely white. There could not be seen a vessel carrying red blood, with the exception of one small artery at the disk. Sight was lost suddenly; there were retinal hemorrhages, and the white spots characteristic of albuminuric retinitis. The patient died of apoplexy several months after her attendance at the clinic, and no organic disease of the heart could be detected. No post-mortem examination was made.

As to the cause of this condition, I have never been able positively to make up my mind. It cannot be due to ischæmia or to embolism, because the retinal vessels, being transparent, simply become invisible when empty.

In a second case, of which I exhibit a drawing, a vessel was in places converted into this white line, while in other places it appeared natural. This was not a case of albuminuric retinitis. It was an inflammatory case, there being iritis and cyclitis, and some opacity of the vitreous humor. There was no indication of albumen in the urine. I was inclined to attribute the condition of perivasculitis, though, of course, it is not possible to say that there may not have been also opacity of the vessel wall. The vessel seems to be broader than normal, in the ophthalmoscopic picture, which would indicate an opacity outside of its walls.

CASE OF TUBERCULAR PERICARDITIS; UNUSUAL AMOUNT OF EFFUSION; ACCIDENTAL PARACENTESIS PERICARDII.

By

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[Read November 3, 1888.]

The patient, a colored man, twenty years of age, was admitted into the medical wards of the Philadelphia Hospital in the fifth week of his fatal illness. A farmer by occupation, he had never used stimulants, nor had acquired any form of venereal disease. He had never been sick, nor have any members of his immediate family had any illness.

Some four weeks prior to admission J. G. began to suffer from a harassing night cough and from dyspnœa. With the inception of the cough and dyspnœa, *i. e.*, in the first week of his illness, fever with irregular chills is recalled, while vomiting was marked for three days. The dyspnœa was most pronounced; increased progressively, and on account of it alone he applied for treatment, having continued at work until four days previously.

Status præsens.—Admitted November 30, 1887. Refused to go to bed because he could not breathe; examined in his chair. Emaciated, though has the frame of a burly negro; temperature 103°; skin hot; large drops of perspiration on brow; extremities most and cool; no œdema; extreme orthopnœa, all extrinsic respiratory muscles acting vigorously; epigastrium

very full and tender on pressure; recti muscles above umbilicus very hard and prominent; no alteration of abdominal respiratory rhythm; face anxious and pinched; veins of neck full and undulating.

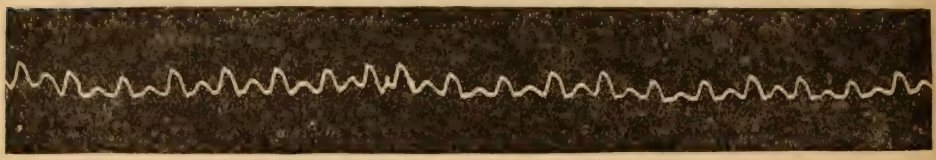
Examination of thorax; inspection.—Undue prominence of the præcordial region; intercostal spaces of left thorax full; expansion of left side anteriorly, laterally, and posteriorly, much lessened; marked expansion below both clavicles; apex beat of heart and cardiac impulse absent.

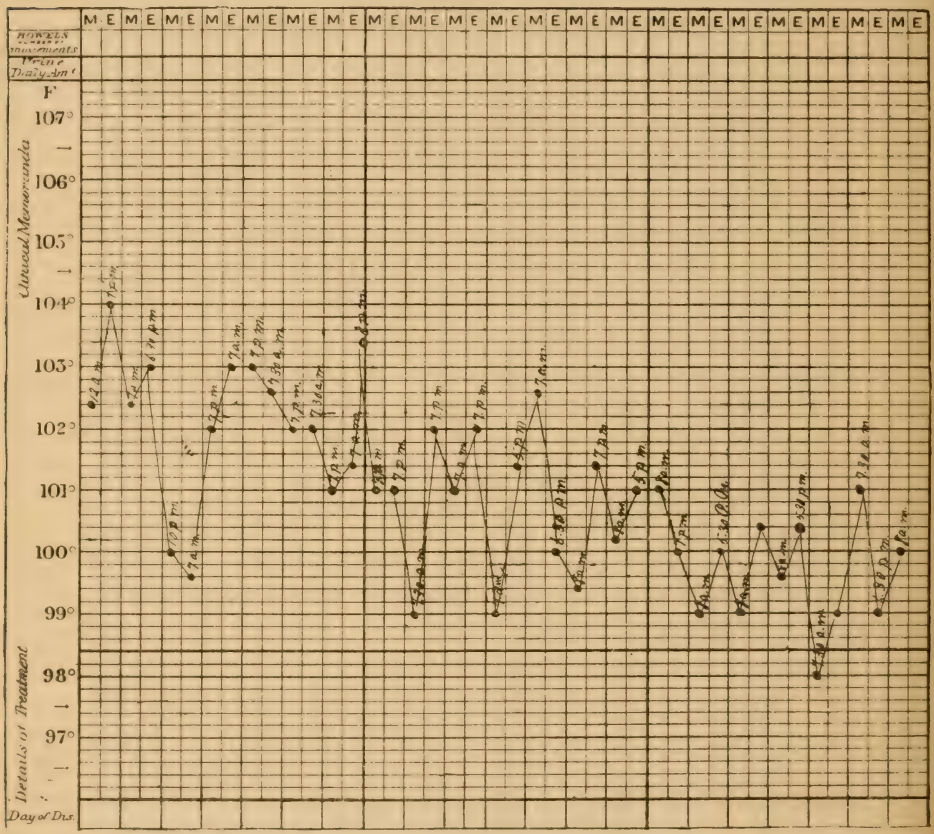
Palpation.—Confirms inspection; no thrill over heart or in vessels; vocal fremitus increased in first interspace left side, lessened in second, and absent below third and in axilla; posteriorly, above scapular spine increased, below diminished, and from angle of scapula, absent; pulse small, feeble, extremely rapid, compressible, and irregular.

Percussion.—From second rib left anteriorly to margin of ribs, dulness; from fourth rib in axilla to eighth rib, dulness; flat from fourth to seventh; semi-dull from seventh to eighth; and below eighth tympanitic. Absolute dulness behind the sternum, from opposite first interspace to xiphoid; the dulness extends one inch to the right of the sternum in the second interspace, two inches in the third, and three and one-half inches, or to the right nipple line, in the fourth and fifth interspaces. Posteriorly, dulness from middle of scapula to base of thorax in angle line; along the vertebra, from seventh to ninth, over an area two inches long and two wide, tympany. Above the eighth rib, from scapular line to axillary region, flatness. Right lung resonant.

Auscultation.—Absence of first sound of heart; second sound feeble at base. Exaggerated breathing in first and second left interspaces; absent breathing below and in axilla. Posteriorly, along vertebra from spine of scapula, bronchial breathing and bronchophony, increasing downward and very marked one inch from spinal column, opposite angle of scapula, where the tympany (on percussion), most marked. In line of angle, breathing exaggerated above spine, lessened below, and quite feeble and distant at the angle, lessening to base. Increased

respiratory murmur all over right lung, much increased in third and fourth interspaces.





The sphygmograph tracing of the pulse and the temperature record are inserted for completeness. The former is a quite characteristic tracing in pericardial effusions, while the chart plainly indicates the occurrence of an active, septic, inflammatory process.

Tongue white-furred; appetite poor; deglutition difficult at times; some nausea; bowels regular; liver and spleen not enlarged; cough not marked; some laryngeal stridor in occasional paroxysms; voice clear; answers questions slowly; some delirium at night; urine scanty, high colored, without casts or blood, but with albumen in small amounts.

On account of the extreme dyspnœa the thorax was aspirated in the sixth interspace in the anterior axillary line, and thirty-seven ounces of bloody fluid were withdrawn at this time, presumably from the pleural cavity. Some relief was afforded, but the patient could not assume the semi-recumbent posture until six days after the tapping. Four hours after the aspiration resonance returned in the second and third left interspaces, and the respiratory murmur became audible. The next day a distinct pericardial friction could be heard to the right of the sternum. Four days after aspiration the physical signs were the same as before the tapping, and during the rest of his life continued the same. The further progress of the disease was rapidly downward to death. Fever, profuse sweats, extreme exhaustion, great emaciation, night delirium, and continuous dyspnœa marked the course. The heart's action became irregular and feeble, and death took place from its failure (December 21, 1887) eight weeks after the disease began.

At the autopsy the pericardial sac was found to be distended by sixty-four ounces of bloody serum. The heart was covered with lymph and the parietal pericardium studded with tubercles. The visceral pericarditis was tubercular. The left pleura and left lung were the seat of miliary tubercle; a few were found in the right lung also. The bronchial glands were enlarged and caseous, and evidently were the original foci of the tubercle bacillus. The spleen and kidney contained hemorrhagic infarcts.

Lack of space forbids more than a summary of the many interesting features of this case, of which the interest centres in the diagnosis. During life it was

thought the patient had a tubercular pleurisy and pericarditis. The autopsy showed the presence of a tubercular pericarditis alone. The physical signs of a pleural effusion, which could be elicited in the anterior, the axillary, and the middle and lower posterior region of the left thorax, appeared to confirm our notion of the presence of fluid in the pleural cavity, with adhesion of the lower lobe of the left lung posteriorly. A pericardial effusion was also thought to be present, because of the absence of the apex beat and impulse not only in its usual position, but also in the position in which it is usually found in large left pleural effusions; because of the increased area of dulness to the right; because of the pericardial friction sound; because of the enfeebled heart sounds; and because of the extreme dyspnœa. Moreover, it was thought, and the autopsy proved the correctness of the view, that an active inflammation of the pericardium was present, because of the early vomiting, the epigastric pain and tenderness, the occurrence of delirium and of a moderate amount of albuminuria, and the excessively rapid and weak pulse. The pressure symptoms of a large pericardial effusion, laryngeal stridor, and difficult deglutition, though transient, lent color to this opinion.

The extremely large pericardial effusion was the cause of the physical signs which simulated a pleural effusion. In the light of the autopsy, in a like case, a pleural effusion might be excluded, if the lower limit of dulness in the axilla did not fall below the eighth rib, and if some resonance and respiratory murmur should be present under the clavicle, and at the same time the physical signs of a compressed, partially collapsed lung could be determined posteriorly. Such conditions were present in

this instance, and, we take, it the right limit of tympany in the axillary region is good proof of the absence of an abundant, non-localized pleural effusion. That the process was tubercular seemed clear, because of the high temperature, exhaustion, profuse sweats, and rapid emaciation.

Tubercular pericarditis is rare, and extremely rare when associated with an enormous effusion. We are unfamiliar with the records of pericarditis of any form with so large an effusion. It is interesting to note the infection of this serous membrane and the lungs from the caseating tubercular bronchial glands.

TWO CASES ILLUSTRATIVE OF BRAIN DRAINAGE.

By

THOMAS G. MORTON, M D.

[Read November 7, 1888.]

Case I.—On September 2d, last, I saw, with Dr. J. V. Kelly, of Manyunk, Miss F., aged thirty, who had been about as usual, and apparently well, until some ten days before. For several months, however, she had occasionally suffered with pain in the right ear, and at times there had been a free purulent discharge. For several years hearing had been quite defective.

She had been confined to bed for eight days with violent pain in her head, of a darting character, which for the previous forty-eight hours had been excruciating. For several days prior to my visit there had been symptoms of cerebral pressure and also delirium, indicating subacute meningitis. Although the hebetude was considerable, the patient could readily be aroused, took food, and intelligently answered all questions. On September 4, forty-eight hours later, the head symptoms were more pronounced, partial coma supervened, and I then decided to make an exploratory trephining operation, believing that her symptoms were due to intracranial pressure, possibly abscess. This view seemed reasonable from the history of aural disease, which, with the present acute symptoms, appeared sufficient at least to warrant an exploration. Indeed, such interference was more than justified by the patient's increasingly serious condition. A trephine one inch in diameter was applied to the right parietal region, about one and a half inches above, and somewhat posterior to, the auditory meatus,

and then, with cutting forceps, an additional amount of adjacent bone was removed. The brain at once bulged, and was so forced through the opening that there was an entire absence of pulsation. The pia mater was found very markedly œdematous. An incision was then made into the brain, a finger carried in, and careful exploration was made. There was no evidence of abscess, but on carrying the finger in deeply a collection of clear fluid—about an ounce or an ounce and a half—was evacuated, which had been contained in either a cyst or more likely in the lateral ventricle; an additional amount of serous fluid followed the withdrawal of the finger, the brain ceased to bulge, its pulsation was established, and further exploration was not attempted. A large rubber drain was placed in the brain to the full depth of the wound made by the exploration, the wound was then thoroughly washed with sublimate solution, and the dura was interruptedly sutured, except at the point where the tube emerged.

The patient was greatly improved by the operation, regained consciousness, took food well, and for several days her condition was encouraging, although the symptoms of brain inflammation continued, but at the end of that time exhaustion supervened and death occurred on September 12th, eight days after operation. No post-mortem could by any means be obtained.

Case II.—*Case of injury of the head; intra-cranial pressure; trephining; abscess of brain; curetting; free drainage; recovery.*—B. J., colored boy, aged ten years. On the 28th of September, 1888, he fell from a railroad car and received a lacerated wound of the scalp; also a fracture of the humerus. His injuries were dressed upon the site of accident at the time, and next day he was brought to the Pennsylvania Hospital. The wound was then cleansed by the resident and again closed.

My attention was not especially called to the lad until several days later, when the wound had begun to suppurate profusely and the boy had become increasingly delirious and maniacal. His condition was then critical. There were symp-

toms of compression, and portions of the external wound had failed to unite and were granulating and suppurating.

I determined to place the patient under anæsthesia and to ascertain if there was not more serious injury beneath than the external appearances disclosed. A large flap being reflected, at once a very extensive stellate fracture of the temporo-frontal region came into view. There was no depression, and the periosteum was in the main intact.

I then trephined at a point in that same region, just to the outside of the centre whence radiated the lines of fracture. This done, the brain bulged strongly into the opening, and did not pulsate. A large number of partially separated portions of bone—probably several square inches in extent—were now also removed, and a correspondingly large area of brain exposed.

An incision carried into the centre of the bulging brain-mass at once gave rise to a free flow of what seemed to be broken-down blood-clot, pus, and sero-sanguinolent fluid, to the amount of about an ounce.

The dural incision was then increased to two inches, and a like quantity of disorganized brain substance, associated with disorganized clot, was gently scraped out of the cavity with a dull curette, and a healthy brain cavity thus secured, which was then washed out with a stream of weak bichloride solution; a rubber drain tube was introduced, and the dural wound sutured around it. The old wound was also curetted, sutured, and drained, and a dressing applied.

At the time of operation the boy had sunk into coma, with signs of tremendous brain tension, but from the time of interference he improved rapidly, and next day was not only conscious, but fairly rational.

Convalescence has been rapid and uneventful. The drain tube was removed on the fourth day. The temperature fluctuated from 101° to 98° prior to the operation, and rose to 102½° the following day. It then steadily fell to normal at the end of the week, and has so continued. Has been up and walking about the ward for some days.

[After the reading of the preceding paper:]

Dr. John B. Deaver said: I have made some experiments on the head of a cadaver with the object of determining the points of the skull which, when trephined, will make the most dependent portions of the anterior and posterior horns of the lateral ventricles most accessible either for aspiration or drainage, with the following conclusions:

For anterior horn: Draw a line from a point $1\frac{7}{8}$ inches external to the centre of the nasal eminence of the frontal bone to a point midway between the external occipital protuberance and the posterior border of the mastoid process of opposite side.

Height for applying trephine: Its lower edge should just clear the supra-orbital margin.

For posterior horn: Draw a line from the posterior border of the mastoid process to the middle of the zygoma of opposite side.

Height for applying the trephine: Its lower margin should be $1\frac{7}{8}$ inches above a horizontal line drawn through the centre of the external auditory meatus. The instrument used for opening the ventricle is to be passed in the plane through which the line passes.

The lines which I have here given are applicable to the child's as well as the adult's head.

BRIEF REPORT OF A CASE OF POISONING FOLLOWING THE ADMINISTRATION OF A MINIMUM DOSE OF A NEW PREPARATION OF ACONITE ROOT.

By

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[Read November 7, 1888.]

I BEG leave to present to the College this preparation, styled the "Normal Liquid Aconite Root," which purports to be three times the strength of the officinal tincture (the formula given by the manufacturers, Messrs. Parke, Davis & Co., in order to make tincture of aconite, U. S. P., being to take of the normal liquid one part and of alcohol two parts). The dose of the normal liquid is stated to be from "Gm. 0.03 to 0.13 (one-third to two minims) well diluted."

The following notes of a case will illustrate the physiological action of aconite in the human subject, and also demonstrate the great activity of the preparation:

Mrs. X., who was nursing an infant nearly three months old, took a drive, October 21st, and as the air was fresh she came home rather chilled. Two days later, in the evening, she complained of pain in the right mammary gland, which was tumid, and one or more lobes were observed to be hard and

tender. There was found a slight central fissure of the nipple, which gave much pain when the child was nursed. She was suffering also with a severe headache; her face was flushed and burning. Her temperature was 104°, and the pulse accelerated. There were no pulmonary symptoms. During the greater part of the day she had been feeling dull and could not keep warm, although she had had no distinct chill. As the appearances were those of incipient mastitis, I carefully measured fifteen minims of the aconite preparation, and mixed it with an equal number of teaspoonfuls of water, and administered one teaspoonful at once. Almost immediately after taking the medicine the patient complained of tingling numbness in her lips and constrictive sensations in her throat. About ten minutes later she vomited the contents of her stomach, consisting simply of tea and toast and the medicine. An hour later, as there had been no amelioration in the pyrexial symptoms, I gave another teaspoonful containing one minim of the normal liquid. In the course of ten or fifteen minutes well-marked symptoms from the effects of the aconite set in. The temperature fell, the skin became moist and cool, and the face was more natural in appearance, and the headache and pain in the breast were very much relieved. The patient now complained that her lower limbs were heavy like lead, and that she could not move them; though she could move her hands and arms, they also were the site of altered sensation. She had now become mildly delirious, and she asserted that the skin had been removed from her hands and wrists; at the same time that she was found to be insensible to pinching or pricking with pins as far up as the elbows and in the lower extremities above the knees. She insisted that her lips were enormously swollen, although they did not present this appearance. Decided diplopia existed, and she complained frequently of cloudiness of vision that made all objects indistinct and blurred. The pulse was soft, small, and compressible, and about 100 to the minute. As the patient seemed sinking into a stupor, restoratives were given, hot drinks, inhalations of ammonia, heat to the extremities, with friction to keep up the circulation. The latter procedure

was strongly objected to by the patient, as she insisted that the skin had been removed from the wrists and ankles, although no change was observed from their usual appearance. In about two hours the diplopia and other nervous symptoms gradually passed away, except that on the next day, or twelve hours later, there was still noticed some heaviness and numbness of the feet and tingling of the hands. The temperature on the following morning was 102°, and did not rise again, possibly because quinine and antifebrine were administered in decided doses during the next few days, under the suggestion of Dr. E. E. Montgomery, who kindly assisted me with his counsel. The mammary gland was compressed by a bandage, and no further advance was made toward suppuration. The patient was soon able to use the breast again in nursing, and has been quite well since, except that her skin remained moist for a few days, and two nights she had profuse sweating.

I have brought these brief notes before the College to-night in order to illustrate—not the danger of this remedy, because all therapeutic agents of any value would be open to the same objection—but the remarkable physiological activity of this form of preparation. I may also call attention to the convenience and ease of administration afforded by this new class of therapeutic agents, and their portability. If a number of such active remedies were more frequently found in the hands of practising physicians, there would be greater accuracy and certainty in the administration of medicines, and—a point not to be despised—there would be a decided reduction in the cost of medical preparations, which in a protracted illness tends to become very burdensome to the patient or his friends.

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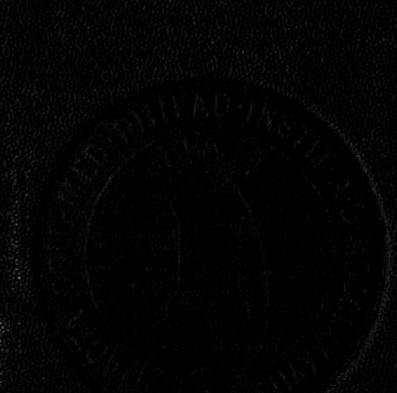
Not for
circulation